The Chemical Age

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Notes and Comments

The Wool Dyeing Discovery

THE discovery in the art of dyeing wool which was explained and demonstrated by Dr. Thomas on February 25, and of which an account was given in our columns at the time, gives rise to thought not only upon the event itself, but also upon the general question of scientific discovery. Whether experts in the practice of dyeing will agree is uncertain, but it has always appeared to us that in dyeing the essential and most difficult thing is to bring the dyestuff into physical contact with the surface of the wool (or other textile) sufficiently quickly and in a sufficient concentration per unit of time. That is a problem to be faced in very many chemical processes. It is for that reason that we are still not greatly impressed by the explanation given that vibration of the individual fibres causes them to "breathe in" the dye, and before it is accepted these should be more convincing proof than observation through a microscope. One way of looking at the operation is by analogy with heat penetration, or with solution. Heat or the materials being dissolved must equally flow through the surrounding media before they become effective. The flow of heat is resisted by the presence of a thin film of fluid which adheres obstinately to the solid surface. This film is, of course, well known and is adequately explained by physicists. It is due to the frictional effect whereby the layer of molecules against the surface is stationary, the next layer slides very slowly over the stationary layer and so forth with a velocity ever increasing as the distance from the surface increases. Any increase in the speed of the relative motion between the liquid or solid surface reduces the thickness of the layer and thus enables heat to flow more quickly, or solute to pass into the main volume of liquid more rapidly. The first effect of motion is, therefore, to increase the rate with which dyestuff is brought into contact with the surface. The old method was by working with a boiling solution whereby agitation was assisted and the viscosity of the solution decreased due to the rise in temperature; agitation is probably more important than the viscosity effect because in passing from 100° to 80° C. the viscosity of water (to take that as an example) only increases by 25 per cent. from 0.00287 to 0.00358; there is thus an *a priori* reason to suppose that agitation would improve physical contact, and that is, we suggest, the real reason for the improved results. There is just one further possibility, namely, that the thin film of adsorbed gases, always to be found on any solid surface, may be the governing factor. The greater the porosity of the surface, that is to say, the greater the development of a minute cell structure on the surface, the greater is the quantity of adsorbed gases. One would imagine that textiles would be particularly prone to adsorption of this character. The passage of dyestuff on to the surface would be hindered by the presence of this film. It is surprising how persistent this adsorption effect can be and how readily the gaseous film is reformed after destruction.

Experience and Practice

METALLURGISTS are well acquainted with the persistence of a smaller film even under the highest temperatures at which metal can be worked. It would not appear likely, however, that agitation with air would have the slightest effect in removing a film of this character, and the adsorbent properties of the wool surface might well be such, and doubtless are such, as would permit of the ready adsorption and absorption of the dye despite any prior gaseous adsorption that might be already in possession of most of the surface. The decrease in the thickness of the stagnant resistant layer appears to us upon the evidence we now have to be the most likely reason for the improvement that has been made in dyeing technique.

If this is correct, we are left with the interesting reflection that here is a simple application of general physico-chemical knowledge which should have been discovered years ago. Why was it not? Is it not largely due to the blessed words "experience" and "practice"? Experience has shown every old-time dyer that wool must always be dyed at 100° C., or at boiling point, whichever is the higher. What is the tyro to do but believe his elders and do the same as they do? If he chances to use a lower temperature he gets a bad result—because he has not agitated the liquid. If he agitates the liquid just once by some fortuitous chance he does not do so the next time and his results cannot be repeated. Experience, therefore, shows him, as it has shown his ancestors, that the prevailing practice is correct. It is only when someone comes along with both scientific knowledge and a healthy disregard for the precepts of "experience" and "practice" that the prevailing notions have a chance of being upset. This sort of thing has occurred in many industries. We could point to a process, for example,

wherein it was necessary to heat a vertical surface uniformly. For fifty years designers attempted to heat the surface uniformly from end to end—and were fairly successful and quite satisfied. Then there arose one genius who pointed out that a vertical heating flame was hotter at the bottom than at the top and that if the surface was to be uniformly heated this also must be taken into account. It had taken fifty years for a fact to be *observed* that had been before the eyes of the practical men of the industry every day and in every works. It is indeed surprising what striking successes can be achieved by questioning those "facts" that are apparently the most obvious. Nothing but good can come of an inquiry into the methods of industry in which scientific minds are let loose upon current practice. It may even be suggested that to get the maximum efficiency every research organisation should contain at least one man of general experience who has had no experience of the work of the industry under investigation. Those in daily contact with practice are too often blinded by the very nearness of vision.

Dr. Carl Duisberg : An Appreciation

PROFESSOR H. E. ARMSTRONG knew Dr. Carl Duisberg, founder and chairman of I. G. Farbenindustrie, whose death was announced a fortnight ago, almost from the time of his entry into commerce, when the dyestuffs industry was just beginning to be of real importance in Germany, and regarded him, all things considered, as the greatest industrialist the world has yet had. In an appreciation published in "The Times" last week, Professor Armstrong said Dr. Duisberg combined in himself so many qualities: such rare genius, such diverse activities, so broad a knowledge and experience, such unusual organising and constructive ability, such mental and personal activity, he so grew in culture and wisdom with years. By carrying out his task successfully Duisberg not only rescued his firm from near bankruptcy, but soon raised it to a level with its great rivals, the Badische Anilin und Soda Fabrik and Meister, Lucius and Brünig. He particularly developed the synthetic drug side and captured the lead in making aspirin by registering this name as a trade mark. The Bayer firm from 1884 onwards, when Duisberg entered it, probably did more than any other to make the German dyestuff industry a world industry before the late war.

Men who have done these things deserve to be studied in every detail. Professor Armstrong hopes that, at no distant date, we may have an intimate dissection of Duisberg's multiple career, with as full an analysis as possible of his character and actions. The story will be one to astound diplomatists and men who deal only with words; it should make some understanding possible of the difficulties overcome in the industrial conquests achieved by scientific inquiry. Of course, Duisberg became a *Geheimer Regierungsrat*. As an industrialist he also had the unique distinction of being made not only a professor but also an honorary doctor in all faculties, including that of theology. On his seventieth birthday, in September, 1931, the University of Bonn paid him the signal compliment of making him an honorary Senator. On this occasion he spoke out very strongly on behalf of the University *Lern* and *Lehrfreiheit*.

Professor Armstrong continues: "Apparently Germany is now bent upon killing the goose that has laid her so many golden eggs—is even persecuting reason. Duisberg clearly forsaw this. Yet she is planning for a future which is impossible without the continuance of his species. Her possible lapse back to barbarism is an event too awful in its consequences to contemplate. Having studied chemistry in the country during nearly three years before the 1870 war, as well as kept in touch with its leaders in the interval, I can appreciate more than most perhaps the astounding changes that have come upon the nation, in mental outlook particularly. A primitive, simple, lovable people, they seem to be becoming one of the most arrogant. We shall do well to face such a threat. Our world to-day is in sorest need of men of the Duisberg type, who will use wisdom in its service."

I.C.I. Dividend

FIGURES published at the end of last week show that a fresh profit record was achieved by Imperial Chemical Industries, Ltd., in 1934. Gross income was over £300,000 higher, and the net profit increased from £6,001,605 to £6,349,107, a gain of £347,502. An extra ½ per cent. dividend on the ordinary shares and 1 per cent. on the deferred shares cost a matter of £327,466. Results for the past three years are shown in the following table:—

	1934.	1933.	1932.
Gross profit	7,965,038	7,663,945	6,415,423
To central obsolescence fund	1,000,000	1,000,000	1,000,000
Income tax	615,931	662,340	686,351
Net profit	6,349,107	6,001,605	4,729,072
Brought forward	566,139	543,770	516,825
Available	6,915,246	6,545,375	5,245,897
Preference dividend	1,588,897	1,588,803	1,586,751
Ordinary and deferred dividend	3,717,898	3,390,433	2,615,376
Rate on ordinary	8%	7½%	6%
Rate on deferred	2%	1%	—
To general reserve	1,000,000	1,000,000	500,000
Carried forward	608,451	566,139	543,770

Although the progress made in 1934 was not so rapid as that of 1933, there are grounds for the belief that profits over the next few years will show a steadily, but slowly, increasing tendency. This view is supported by the new capital proposals, whereby the deferred shares are consolidated into the ordinary. The terms of the exchange appear reasonable, at present levels of prices and earnings. The allocation of one ordinary share for every four deferred corresponds well with the ruling prices. If profits decrease, of course, the ordinary shareholders will have reason to complain: if they increase, the deferred holders will have lost the whole of the benefit from the high gearing. The "dividing line," at which the earnings of the shares are the same under the old and under the new régime, is reached when the disposable profits, after payment of preference dividend, reach £4,600,000. This year the disposable profit is £4,760,210, but as a matter of £1,000,000 is almost automatically put to reserve, the distributable profit cannot be regarded as above £4,000,000. For the moment, therefore, it would appear that the deferred shareholders are getting a little the better of the bargain. Profits will not have to increase very far, however, before the "dividing line" is reached, so that the ordinary shareholders need not be concerned at the proposed exchange.

Recent Researches on Certain of the Rarer Elements

Professor G. T. Morgan's Presidential Address to the Chemical Society

Professor G. T. Morgan, President of the Chemical Society

FIFTEEN years ago it was known that acetylacetone furnished with a great majority of the chemical elements derivatives containing the univalent radical $C_5H_7O_2'$ which functions as a chelate group implicating the metallic or metalloidal atom in a six-membered ring, said Professor G. T. Morgan, in delivering his presidential address to the Chemical Society on March 28.

In 1920, a study, in collaboration with Dr. Drew, on the interactions of acetylacetone and the tetrachlorides of selenium and tellurium showed that the main products differed from all previously-known acetylacetone derivatives in containing a bivalent radical, $C_5H_6O_2''$, and, although fourteen years have elapsed, selenium and tellurium still remain the only two elements which are known to give this result. An elucidation of the chemical nature of these exceptional products was achieved in the course of further researches carried on for five years (1920-25) in the University of Birmingham.

Selenium Acetylacetone and Homologues

With selenium tetrachloride, acetylacetone reacts in accordance with the following equation :—

$$4C_5H_8O_2 + 2SeCl_4 = Se_2(C_5H_6O_2)_2 + 2C_5H_7ClO_2 + 6HCl.$$

The dimeric complexity of selenium acetylacetone was indicated by molecular weight determinations and by its reactions with such chemical reagents as *C*-ethylacetylacetone, hydriodic acid, hydrogen cyanide and the thionaphthols. The by-products are the lachrymatory 3-chloroacetylacetone and hydrogen chloride, and since the latter exerts a destructive action on selenium acetylacetone subsequent condensations were generally conducted with the copper derivatives of acetylacetone and its homologues in order to reduce the liberation of free acid.

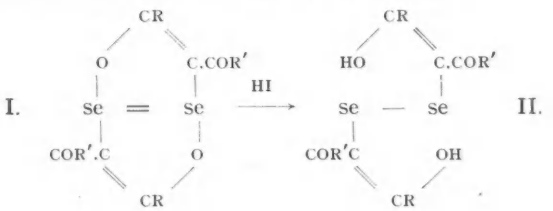
One practical outcome of this discovery was soon apparent. When selenium acetylacetone is treated with aqueous sulphurous acid or bisulphite, acetylacetone is regenerated and selenodithionic acid or one of its salts is produced in quantitative yield :

$$Se_2(C_5H_6O_2)_2 + 4RHSO_3 = 2C_5H_8O_2 + 2Se(SO_2R)_2$$

where R = H, Li, Na, K, Rb or Cs. These selenodithionates were obtained crystalline; the free acid was concentrated to a 50 per cent. aqueous solution. This process affords the simplest means of obtaining selenodithionic acid and its salts in a state of purity.

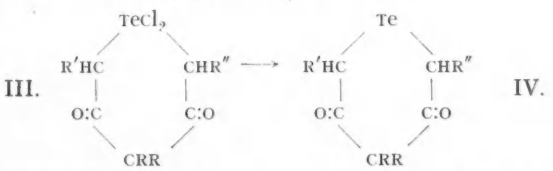
The reaction between selenium tetrachloride and copper acetylacetone was extended and found to take place with the copper derivatives of β-diketones having the general formula $RCO.CH_2.COR'$. The radicals R and R' may be either alkyl or aryl groups, but in order that a bivalent radical RCO : C.COR' may be manifested it is essential that the hydrogen atoms originally present in the methylene residue shall not be replaced by other groups. When this requirement is fulfilled, dimeric selenium β-diketones of the general type (I) are obtained.

When these cyclic compounds are treated with hydriodic acid, the bridge ring is opened at the selenium-oxygen links and diselenium bis-β-diketones (II) are produced.



Cyclo Telluropentane-3 : 5-diones

The bivalent radicals revealed in the condensations between tellurium tetrachloride and β-diketones arise from a twofold terminal enolisation of these substances, so that the metalloid becomes implicated in a six-membered ring as shown in the general formula for the primary product (III)

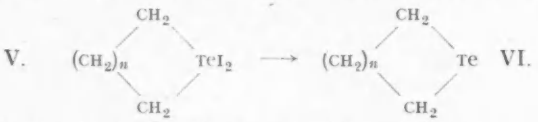


which is a *cyclo*-telluripentane-3 : 5-dione-1 : 1-dichloride. On reduction with aqueous bisulphite the chlorine is eliminated, and a *cyclo*-telluropentane-3 : 5-dione (IV) is obtained. Numerous members of the latter series have been prepared. They are yellow substances, sparingly soluble in water, giving solutions of considerable bactericidal potency. It is evident that these compounds are truly organometalloidal derivatives with tellurium implicated in a six-membered ring. Accordingly, steps were taken in collaboration with Mr. F. H. Burstall and the late Dr. H. Burgess to obtain the corresponding tellurohydrocarbons and the analogous selenium derivatives.

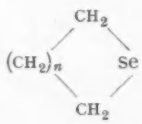
Cyclo Telluro- and Seleno-hydrocarbons

By direct combination of polymethylene di-iodides and tellurium, cyclic telluridi-iodides (V) were obtained, which, on reduction with aqueous bisulphites, furnished the *cyclo*-tellurohydrocarbons (VI) as very oxidisable oils having a repulsive odour.

These reactions were realised with facility when *n* is either two or three, with greater difficulty when *n* is one and not at all when *n* is four or a higher number. The five and six numbered rings were also obtained by interaction of the appropriate polymethylene di-iodides with aluminium or sodium telluride. The latter method was tried with 1 : 18-di-iodo-octadecane, but a nineteen-membered ring was not obtained. A small proportion of a dimeride $Te:(C_{18}H_{36})_2:Te$ was isolated, but the main product was a higher polymeride.



Cyclo-selenohydrocarbons containing selenium were obtained by a reaction between polymethylene dihalides and sodium selenide and it was shown that the ring systems (VII) were realisable



when *n* was either one, two, three, four or sixteen. These *cyclo*-selenohydrocarbons are colourless oils having a pungent odour.

Extraction of Rare Metals from British Minerals

Germanium and Gallium from Northumberland Coal Ash. Coal ash from certain seams in the Northumbrian coalfields contains notable quantities of germanium and gallium. The former metal was extracted in the form of its volatile tetrachloride by distilling this ash with concentrated hydrochloric acid in stoneware apparatus. Gallium trichloride remains in the residue together with excess of iron salts. After reducing the latter to the ferrous condition the gallium compound is extracted with ether. On removing the solvent the gallium is deposited as hydrated oxide by fractional precipitation with weak bases.

Rhenium from Australian Molybdenite. As Australian molybdenite had not previously been examined for rhenium, Dr. G. R. Davies of the Teddington Laboratory is making a systematic examination of this mineral with the object of extracting any rhenium which may be present. For this purpose, finely-divided molybdenite is oxidised with concentrated nitric acid. The molybdenum is removed to a considerable extent as hydrated trioxide and a further amount is precipitated as ammonium phosphomolybdate. Molybdenum and rhenium sulphides are precipitated from the mother liquor, converted into sulphates and distilled in hydrogen chloride. Under these conditions, rhenium volatilises more readily than molybdenum so that a further concentration of the former is effected in the distillate from which the remainder of the molybdenum is precipitated by 8-hydroxyquinoline, whereas perrhenic acid is deposited from the final filtrate as nitron perrhenate. In the course of this research, new double rhenocyanides have been discovered and 2 : 2′-dipyridyl has been shown to afford an alternative method for separating molybdenum from rhenium since it precipitates the former as dipyridyl molybdate leaving in solution dipyridyl perrhenate.

Co-ordination Compounds of Ruthenium. In collaboration with Mr. Burstall a study is being made of ruthenium derived from the Mond Nickel Company's mines in Sudbury, Ontario. The trichloride of this metal absorbs ammonia and the product dissolves in water to an intensely red solution. This " ruthenium red " was shown by Joly, in 1893, to have great affinity for natural silk, dyeing this fibre in purplish-red shades. Ethylenediamine gives rise to similar red solutions, but there is no evidence of a similar combination with 2 : 2′-dipyridyl.

A convenient starting point for the production of well-defined co-ordination compounds of ruthenium is potassium nitrosoruthenochloride $K_2[Ru(NO)Cl_5]$, an analogue of the well-known potassium nitroprusside $K_4[Fe(NO)(CN)_5]$. With 2 : 2′-dipyridyl two complex compounds are obtained, one green and the other reddish-brown, which are regarded as stereoisomerides having the formula $[dipy\ Ru(NO)Cl_3]$. 2 : 2′ : 2″-Tripyridyl reacts as a tridentate base, expelling one of the chlorine atoms from the co-ordination complex, thus giving rise to a soluble chloride $[tripy\ Ru(NO)Cl_2]\ Cl$ and to an insoluble nitrosoruthenochloride

$$[tripy\ Ru(NO)Cl_2]_1[Ru(NO)Cl_5].$$

Professor Morgan concluded his address by referring to the mineral sources of rare metals existing in various parts of the British Empire. He expressed the hope that these elements, which had unexplored potentialities, would in the future receive more systematic investigation by British chemists than had been the case in the past.

Sir William Bragg on Research

Professor Morgan presided at the anniversary dinner of the Chemical Society at Grosvenor House on the evening of March 28. Amongst those present were Lady Reading, Sir Harold Hartley, Sir Joseph Petavel, Mr. Robert H. Goodsall, Sir Frederick and Lady Hopkins, Sir Frank and Lady Smith, Sir Henry Dale, Professor J. F. Thorpe, Mr. John Evans, Major E. Saville Peck, Mr. E. Wallace, Professor E. C. C. Baly, Dr. F. L. Pyman, Mr. W. Rintoul, Professor W. M. Thornton, Professor C. H. Desch, Professor F. G. Donnan, Dr. H. J. T. Ellingham (hon. secretary), Professor G. I. Finch, Major F. A. Freeth, Professor C. S. Gibson, Contessa Cippico, Dr. J. Masson Gulland (hon. secretary), Professor A. Harden, Sir Phillip Hartog, Dr. J. T. Hewitt, Professor C. K. Ingold, Mr. Emile Mond (treasurer), Professor T. S. Moore, Professor F. A. Paneth, Professor James C. Philip, Dr. R. H. Pickard, Mr. J. Davidson Pratt, Professor John Read, Sir Robert and Lady Robertson, Professor R. Robinson, Professor F. M. Rowe, Principal G. Senter, Professor J. L. Simonsen, Professor S. Sugden (hon. secretary), Lady Stockman, Dr. Martha A. Whiteley, Professor W. P. Wynne, and Mr. S. E. Carr (assistant secretary).

Lord Reading, submitting the toast of " The Society," expressed his appreciation of its work. It was the oldest chemical society in the world, and deserved well of the country for the work it had done. In all the complexities of life to-day chemistry played a most important part, and he had the greatest admiration for those who were engaged in chemical research.

The President, responding, said that no fewer than twenty prominent members of chemical industries had joined the institution during the past year.

Sir William Bragg, Director of the Royal Institution, acknowledging the toast of " The Guests," proposed by Dr. N. V. Sidgwick, president-elect, said they all knew how much research had meant to this country, but were they all satisfied? Frankly, he was not. He did not feel satisfied at the present time with all that we were doing in science. A great deal of what we were doing was not carrying the weight that it should. They knew that if science could have a perfectly free hand—and let them acknowledge at once that that was impossible—the conditions of life could be very greatly raised. They knew what research was capable of doing. They had felt the value of that during the war. The best results of science were not yet accomplished, although they had done a lot. They were disappointed because it was always possible to put their results to military uses. After all, science was like the metal or iron of the scriptures, which could be turned with equal readiness into ploughshares or swords, and they could make as easily a spear as a pruning hook. There was no one who did not hate the idea of using the results of science to add to the pain and misery of men. They could not remedy that, for it was beyond their power but they would like to have it in their power to alter conditions where they could. They had the knowledge to provide better homes, better health, and better conditions all round if only it could be brought into focus and carried out.

Dr. N. V. Sidgwick was afterwards inducted as president of the Society.

In connection with the use of brine solutions in meat curing, refrigeration and other processing operations, the problem of dissolving rock-salt without contamination of the brine is solved by the use of nickel-clad dissolving equipment. A recent article (" Industrial and Engineering Chemistry," News Edn., 1934, *12*, 462) illustrates a dissolver in which the top, shell and conical bottom of the unit are of nickel-clad steel, with pipes and other fittings of Monel metal. The unit described is 48 in. diameter and is capable of producing 200 gallons of pure saturated brine per hour.

The Society of Dyers and Colourists

PROFESSOR ARTHUR G. GREEN was re-elected president at the fifty-first annual meeting of the Society of Dyers and Colourists, held at the Dorchester Hotel, Park Lane, London, on March 29. Professor W. M. Gardner, Professor A. G. Perkin, Professor F. M. Rowe and Mr. C. Schardt were elected vice-presidents, and Mr. H. Jennison and Mr. G. G. Hopkinson were re-appointed hon. treasurer and hon. secretary respectively. The meeting was followed by the annual dinner, at which Professor Green presided over a distinguished company, including Sir Henry Sutcliffe Smith (Bradford Dyers' Association), Mr. R. H. Goodsall (Prime Warden of the Dyers' Company), Professor E. C. C. Baly (president of the British Association of Chemists), Mr. A. Frobisher (Wool Industries Research Association), Mr. G. E. Holden (English Velvet and Cord Dyers' Association), and the officials of the local sections of the Society.

Response to Jubilee Appeal

The PRESIDENT recalled the fact that at the jubilee dinner of the Society last year he appealed to the industries concerned for some measure of financial support. He now announced with pleasure that the appeal had met with a gratifying response from large industrial associations and firms, several of which had agreed to meet half the subscriptions of those members of their staffs who desired to become members of the Society. In thanking those firms and expressing the hope that their support would be extended, he pointed out the advantages which he hoped would accrue from these arrangements, not only to the Society and to the younger technologists in the firms concerned, but to the whole of the British tinctorial industries in general. The increase in membership would supply the Society with more funds for the conduct of its activities. The assistance given by the firms would enable many young chemists and dyers who would not otherwise be able to join the Society to do so, thus providing them with the advantage of receiving the Society's journal and taking part in the discussions. Professor Green announced that he had that afternoon received a telegram from the Dyestuffs Group of Imperial Chemical Industries, Ltd., stating that the group would be glad to make a grant to the Society of £100 per annum for the next three years. He also announced a gift of £50 from Mr. R. D. Chorley.

Dr. E. LESLIE BURGIN, Parliamentary Secretary of the Board of Trade, proposed the toast of the Society, and in the course of a humorous speech he mentioned that one of the Society's past presidents was the late Lord Moulton. He doubted whether there had ever been an occupant of the bench with the same knowledge and the same understanding of their arts and activities, and it had been a great honour for subsequent presidents to follow in the footsteps of one whom the world venerated. The Society was doing a great work in the promotion of scientific knowledge among textile colourists and its membership of over a thousand was distributed over all parts of the world.

Co-operation and Competition

Mr. GEORGE DOUGLAS (Bradford Dyers' Association), in responding to the toast, said he was one of the few remaining original members of the Society. The dyers owed much to the "colourists," the scientists, who had provided the Society with many eminent presidents. The dyers were of a more prosaic type, and apart from the production of colours they had to call upon the scientists for their aid in connection with the application of the colours which they handled. The scientist, however, had not yet taught the dyer how to get a remunerative price for his products. That was a big problem and it was clear that they would have to alter their marketing methods. In that connection they were fortunate in having a friend like Dr. Burgin, an influential member of the Board of Trade. Both sections of the Society—the dyers and the colourists—had appealed to the Board of Trade. The Dyestuffs Act had enabled the British dyestuff maker to make 80 per cent. of our requirements instead of 15 per cent. which was the rule before the war. That was not the only advantage that the Act had achieved. It had encouraged the scientific man. The dyers were looking to the Board of Trade for assistance in reorganising themselves on sounder lines. They had got into a parlous state in which they seemed to be hypnotised and incapable of breaking the spell. The hysteria of individualism run mad stood in the way of reorganising their industries. They had got to reorganise on co-operative instead of competitive lines. They had ample competition from other manufacturing nations. Those other nations were co-operating within themselves, while we in this country were spending our energies on extreme competition among ourselves instead of getting together in an endeavour to increase our total trade.

Speeches at the Annual Dinner in London

A Plea for Reciprocity

Dr. HERBERT LEVENSTEIN proposed the toast of "The Dyestuffs Industry" and said that it was only comparatively recently that this country had become dyestuff-minded. One of the great benefits of the dyestuffs industry was the encouragement it had given to the pursuit of organic research, one of the most delightful occupations in the world. When the Dyestuffs Act was passed they all hoped that they would do a big export trade, and it had been a disappointment to some people to find that we were still importing into this country a fairly large quantity of dyestuffs. It was quite clear that we could not make everything satisfactorily and economically in small quantities and it was inevitable that there should still be a substantial importation of certain dyestuffs. At the same time, he urged that those countries from which we imported the specialities which they made well and which our dyers desired to have should reciprocate to the extent that they should consent to import from us in corresponding quantities those dyestuffs which we made very well and those specialities which he was sure their dyers and calico printers would be glad to have.

Mr. J. ROGERS (Imperial Chemical Industries, Ltd.), who responded to the toast, said it was not possible to manufacture in this country all the dyestuffs we required. The users in this country would suffer very seriously if anything were done to interfere with the free access of those specialities which they required from abroad. It was not the policy of the dyestuffs manufacturers in this country to imitate slavishly those things that were coming in unless there was an extraordinarily good reason for doing so, but rather to spend money in developing new lines and new classes of dyestuffs and giving the users the novelty they required for the continuation of their business. A great deal of money was being spent in that direction. It had been suggested that owing to the turn of commercial events the makers were spending the users' money, but he could assure them that they were going to spend it well if they could.

The Development Committee

Mr. R. WADDINGTON (chairman of the Dyestuff Development Committee) proposed the toast of "The Colour-Using Industries," and said it had been a pleasure to him as a member of the Dyestuffs Development Committee for many years to see how closely the two sides of the industry had co-operated. They had not always seen eye to eye; there had always been some divergence of view and sometimes it had been very pronounced, but there had always been a very real desire to promote the welfare of the industry as a whole.

Sir KENNETH LEE (Tootal, Broadhurst, Lee Co., Ltd.), in responding, said the only way in which they could revive the textile industry was by finding new lines and by doing infinitely more research. They could not compete on a level with other nations doing the same things. They had got to do something better or go down. There was sufficient scientific ability in this country to enable us to go forward if we were only willing to employ the scientists. He was doubtful, however, whether many of the scientists present that night would consider they were sufficiently well remunerated to justify their coming into the industry. He only hoped the next generation would be better treated in that matter.

Professor F. M. ROWE (Leeds University) proposed the toast of the guests, and Dr. G. T. MOODY (Renter Warden of the Dyers' Company) responded.

Accelerators of Vulcanisation

The Relationship Between Activity and Temperature

THE discovery that certain inorganic substances have the power to accelerate vulcanisation was actually coincident with discovery of vulcanisation itself, said Mr. F. H. Cotton, M.Sc., A.I.C., A.I.R.I., in a paper on "Accelerators" read before the Scottish Section of the Institution of the Rubber Industry, at Edinburgh, on March 26. Organic accelerators, however, were not introduced until the early years of the present century.

In the United States, Marks, of the Diamond Rubber Co., discovered that the relatively poor physical properties and slow rate of vulcanisation of certain low-grade rubbers was largely due to the fact that they lacked substances which could be extracted by acetone from fine hard Para rubber. At that time the Diamond Rubber Co. was interested in the use of Jelutong Rubber—a cheap resinous material obtained from trees growing in Borneo and Sumatra. By extraction of the large excess of resin from this rubber by means of a mixture of acetone and solvent naphtha a commercial rubber could be obtained for as little as 50 cents per lb.; but the product did not give results on vulcanisation equivalent to those associated with fine hard Para. The problem was submitted to Oenslager, who, in 1905, found that mercuric iodide had a remarkable effect in speeding up the vulcanisation of low-grade rubbers and giving a product of greater tensile strength than had hitherto been possible. Numbers of tyres and other articles vulcanised by the aid of this chemical were sold in 1905; but the following year complaints were made that they had perished. The mercuric iodide had not only accelerated vulcanisation but had hastened oxidation.

Use of Aniline

As a result of further experiment Oenslager found it possible to accelerate vulcanisation and obtain a good ageing product by incorporating a small quantity of aniline with the rubber; this was used by the Diamond Rubber Co. for many years. Aniline has the disadvantage of being poisonous; so, as the amino group was considered responsible for the toxic properties, attempts were made to condense aniline with other substances in order to produce a less poisonous which might still prove to have accelerating properties. This led to the discovery that diphenylthiourea (thiocarbanilide) produced by the action of carbon disulphide on aniline was superior in accelerating properties to the parent amine but far less poisonous. This may be considered the first successful accelerator.

In Germany, the discovery of accelerators was really the result of an investigation into the rapid deterioration and difficulty in vulcanising synthetic rubber. It was found that the natural product contained a small quantity of nitrogen which was absent from the synthetic product. Experiments were made adding small quantities of certain amines to the synthetic rubber before vulcanisation, and it was soon discovered that piperidine had a profound effect in increasing the rate of vulcanisation and producing a more stable product. The Bayer Chemical Co. quickly realised the importance of this discovery and hastened to apply it to the vulcanisation of natural rubber. As in the case of aniline the piperidine proved an awkward material to incorporate with rubber; experiments made with derivatives soon resulted in the discovery of the remarkable efficiency of the dithiocarbamate produced by reaction with carbon disulphide.

Reduction in Sulphur Additions

Since these early days many hundreds of organic accelerators have been developed, and it has been found that not only do they speed up vulcanisation but they result in a product of increased tensile strength and toughness, improved ageing properties and better resistance to tear and abrasive wear. They greatly reduce the amount of sulphur which must be added to the rubber, lower the time and temperature of vulcanisation and facilitate use of bright organic colouring matters, which were hitherto unsatisfactory. The most important classes of organic accelerator are the aldehyde amine condensation products, the thioureas, the guanidines, the dithiocarbamates, the xanthates, the thiuramdisulphides, and mercaptobenzothiazole and its derivatives.

As for several years it has been possible to produce accelerators of any required degree of activity, recent research has concentrated upon the development of accelerators showing a high critical temperature below which they were relatively inactive and delayed action accelerators exhibiting a time lag even at vulcanising temperatures. Experience has shown that of accelerators of equal activity at, say, 141° C. some give a rubber stock which can be readily processed without fear of premature vulcanisation, whilst others are liable to cause scorching during milling or extruding or "set-up" during storage. It has become apparent that the activity of certain accelerators develops at a lower temperature than that of others. The demand to-day is for relatively rapid accelerators which, nevertheless, have a sufficiently high "critical temperature" to obviate any tendency to prevulcanisation.

Critical Temperature

Hitherto there has been no generally accepted definition of the term "critical temperature" as applied to an accelerator although many attempts have been made to find the critical temperature of individual products. It has been felt that if the critical temperature of an accelerator have any meaning it should be possible to find it by investigating the temperature coefficient of vulcanisation in the presence of that accelerator. The temperature coefficient of vulcanisation with sulphur alone is accepted as being in the neighbourhood of 2.5 (*i.e.*, the rate of vulcanisation increases 2.5 times for every 10 degrees rise in temperature). If the temperature coefficient of vulcanisation in the presence of an accelerator were the same as for that of a rubber-sulphur mixing, any two accelerators of equal activity at a given temperature must be of equal activity at any other temperature; the fact that this is not the case indicates either a different temperature coefficient for each accelerator or a sudden change in the temperature coefficient of an accelerated mix at a temperature characteristic of the particular accelerator employed.

Considerable thought was given to the development of a method whereby the temperature coefficient of vulcanisation in the presence of various accelerators could be determined with accuracy at different temperatures. Two general methods were available: either to follow the course of vulcanisation by determination of combined sulphur or to apply some physical criterion as an indication of state of cure.

The Temperature Coefficient

The modulus was found to be extremely susceptible to slight changes in vulcanisation, and in order that comparable results might be obtained with different ring test-pieces it was found necessary to compare their thickness by weighing the rings on a chemical balance rather than by measuring the thickness with a micrometer gauge as is the usual practice. From the results of modulus tests on 1/16 inch rings a series of curves was drawn relating modulus with time of cure at each particular temperature. The "time" at which each of the curves cut the line indicating the "standard" modulus was taken as the equivalent cure at that particular temperature. Another series of curves was then drawn relating the equivalent cure in minutes with the temperature of vulcanisation. The temperature coefficient was then calculated by dividing the equivalent cure at one temperature by the equivalent cure at a temperature 10° C. higher. The result was considered to be the temperature coefficient of vulcanisation at the mean of the two temperatures investigated. It was finally possible to draw a curve relating the temperature coefficient with the temperature of vulcanisation in the case of each of the accelerators investigated.

It is interesting to note that with most of the accelerators investigated the temperature coefficient at relatively low temperatures (115°-120° C.) is much higher than that of a rubber-sulphur mix. As the temperature of vulcanisation is raised, however, the temperature coefficient generally falls rapidly to a minimum, after which it again rises over a varying range of temperatures before it finally drops a second time. It is believed that the initial steep descent visible on the curves of most of the accelerators tested is a descent from the critical temperature which would appear as a sharp peak in the curve.

The Widening Scope for Constructional Materials

Need for Co-operation Between Supplier and User

THE chemical engineer, in spite of the various definitions which have been applied to him, has, on the question of constructional materials, a definite mechanical engineering complex. This opinion was voiced by Mr. J. McKillop in a paper on materials used in the construction of chemical plant, read at a joint meeting of the Institution of Chemical Engineers with the Manchester Metallurgical Society, held at Manchester on March 29. Mr. McKillop stated that all the materials employed were measured in terms of those with which they were most familiar, namely, iron and steel, and that all materials used in the construction of chemical plant should possess the qualities of iron and steel as regards strength, durability, ease of fabrication, accessibility of supplies and the initial cost.

Wood Vats and Rubber-lined Vats

Vats, tanks, filterpress plates, agitator propellers for mixers, are made from wood and the craft of the cooper and carpenter is employed to a considerable extent in the chemical industry, wood being comparatively cheap, easily obtained, and reasonably durable when used in contact with weak acid and alkali liquors at normal temperature. Its strength is low in comparison with steel, but in many respects it is a convenient material. This satisfactory state, however, does not exist when the vat or item of the plant is in contact with acid liquors at boiling temperatures or where violent agitation is required, because disintegration of wood fibre does occur. This results in contamination of the chemical product and requires some difficult manufacturing operation to separate this objectionable matter at some later stage in the process. The imperfections of wood for these conditions have been responsible for the development of protective linings and substitutes for wood. The first lining of the non-metallic type to be developed for wood vats was ceramic tiles jointed with acid- or alkali-resisting cements. These have only been partially successful, because it is not possible to obtain a perfectly non-porous jointing material equal to the tile nor to guarantee that the cemented joints will remain tight for any length of time without attention. In recent years, rubber has been used to replace tile linings, immense strides have been made in developing suitable adhesives for fixing soft rubber to metal, and now rubber-lined steel tank wagons are the accepted vehicles for the transport of hydrochloric acid in bulk, and rubber-lined steel tanks are employed for the storage of hydrochloric acid. Rubber-lined pumps and piping are also looked upon as common appliances for handling this highly corrosive acid. In some cases, wood filterpress plates have been replaced by rubber press plates for filtering acid solutions, and although the first cost has been high, they have proved to be an economic investment.

Synthetic Resins and Stoneware

Among the new anti-corrosive materials that have been employed is a phenol-formaldehyde condensation product compounded with high-grade asbestos fibre, from which all traces of soluble matter have been removed. This material can be moulded into large vats, formed into pipes, valves, pumps, fans and even made into screwed bolts. It is resistant to and can be used for boiling solutions containing hydrochloric acid. A vat, 3,000 gal. capacity, has been in constant use in this country for over six years on 10 per cent. hydrochloric acid solution, varying in temperature from normal to boiling point, and has not shown any sign of attack.

Stoneware requires tender handling to get the best out of it, and, although it has been replaced to a large extent by inert metals, it still has a large sphere of usefulness. Like any other materials, it has improved immensely by the stimulus of competition and one can now obtain first-class mechanical equipment in stoneware, such as pumps, fans, etc., which are efficient and dependable. Stoneware, however, is lacking in strength, but being comparatively cheap will continue to find steady employment in the chemical industry until a stronger substitute which is not more expensive is found. Volvic stone obtained from the Clermont Ferrand quarries in France is used in its natural state for the construction of plants in which sulphuric acid is concentrated from 70 per cent. to 95 per cent. by direct flame heating. The only thing in its favour is that it withstands these conditions better than any other material at present available; improved methods of concentrating sulphuric acid and the discovery of a suitable material for the construction of the plant will undoubtedly see its end.

The use of glass in chemical plant construction is small now in comparison with the quantities used for nitric acid condensers before the days of chromium-nickel steels. It served a need in a very unsatisfactory way when nothing better was available, and still finds a humble place as a container for corrosive liquids.

A Bewildering Range of Alloys

The choice of metals and alloys to-day is rather bewildering, but it is more than evident that the discovery of chromium-nickel steel was a boon to the chemical engineer. It put at his disposal a material which would resist the action of nitric acid at practically all concentrations: it was a material which apparently could be used like steel and would enable him to clear out much of the glass and stoneware he had been forced to use, and it appeared to conform to the ideals laid down by his engineering principles. There was a general tendency to treat this material during the construction stages in exactly the same way as mild steel. Plates in the "as rolled" condition were used for riveted and welded construction, caulking of the riveted seams being done according to boiler shop methods. Some of these early efforts were amazingly successful and are still in use after ten years' service in difficult operations, but some failures occurred for apparently no known reason. Welded tanks, gas pipes and vessels which had been tested and passed as satisfactory, split along the plate adjacent to the weld while lying on the site awaiting erection; welded flanges on pipes dropped off when they were being erected or during the process of making the first joint, and with these occurrences a considerable amount of alarm was created. Later, softened and descaled plates were recommended for riveted work and heat treatment after welding for welded apparatus. With the plates in the softened and descaled condition, it was reasonable to expect that shaping, riveting and especially caulking would be more easily done. This, however, did not remove the trouble, because in caulking the riveted seams work hardening took place and actually it was found possible to crack a plate along the seam by excessive caulking. It has been found that by making small but highly important changes in the chemical composition of the alloy, such troubles can be very greatly reduced. Information on the physical or chemical properties of chromium-nickel steels and chrome iron now available is easily obtained from the manufacturers, together with lists showing the effect of chemicals on these metals.

Long before chromium-nickel steels were thought of in connection with chemical plant construction, castings made of iron and silicon were employed for highly corrosive conditions, as in the case of condensers for nitric acid, with object of replacing stoneware, glass and lead. The silicon content varied between 6 and 13 per cent. This material is extremely hard and brittle, and the early attempts in large castings were disappointing owing to its inability to withstand changes in temperature without cracking, many failures being due to the cast iron complex being applied to material which only resembled cast iron in appearance.

Chemically-Pure Lead

Large quantities of chemically pure lead are employed in the chemical industry, on account of its resistance to attack by sulphuric acid at all concentrations up to 95 per cent. cold and 75 per cent. hot. It possesses a number of convenient qualities as a construction material, but is deficient in two very important features. It is low in tensile and compressive strengths and has a tendency to creep at ordinary boiling temperature. Attempts have been made to remedy these defects by alloying lead with other metals, while still retaining its acid-resisting qualities; the most recent example of this kind has been in the addition of tellurium. The chief advantage this alloy has over chemically pure lead is that it can be permanently work-hardened by cold working. If chemically pure lead is work-hardened it self-anneals rapidly

at ordinary temperature. The material is comparatively new and, so far as is known, the ordinary construction technique for chemical lead applies equally to tellurium lead. Extended corrosion tests are in progress, but it is not yet possible to state if the new alloy is equal to chemically pure lead.

The tendency of lead to flow or creep at elevated temperatures, and its low strength at normal temperatures, were responsible for an important development in connection with the application of lead linings for steel tanks. Lead is now fixed to steel so securely that the two metals can only be parted by a hammer and chisel, and even then it is not possible to effect a clean separation. The advantages of this combination will readily be seen for plant subject to temperature and pressure, or as vacuum receivers. Great care is necessary in the construction of homogeneous lead lined items of steel plant to ensure that the lining is free from pinholes and that adhesion of the lead to the steel is perfect, because a small pinhole may give rise to much trouble by giving access of a highly corrosive liquid to the steel and causing the formation of salts between the two metals.

Aluminium for Handling Nitric Acid

Aluminium is a useful metal for the construction of certain kind of chemical plant and has recently come into prominence as a suitable material for the construction of nitric acid plants, owing to its resistance to strong concentrations of that acid at temperatures up to 100° C. Storage tanks for 96 per cent. to 99 per cent. HNO_3 up to 60 tons capacity are made of 99.8 per cent. aluminium in welded construction, and it is a serious rival to chromium-nickel steel for that purpose. Aluminium drums are now being used for the transport of strong nitric acid and have replaced to a large extent glass carboys packed in straw which were a constant source of danger both in transport and handling of this acid. It also fills a definite need in plant construction where the purity of the final product is an important factor; for example, the manufacture of synthetic resins and varnishes. The important points to be observed in aluminium construction are that where the metal is used for contact with strong nitric acid it must be 99.8 per cent. pure, and that the welds are hammered to a homogeneous mass equal to the plate. Aluminium is not suitable for employment at high temperatures or in contact with caustic liquors.

Enamelled Cast-Iron

In the production of dyestuffs it is essential to avoid contact with iron or steel in certain phases of manufacture, and a good acid-resisting enamel lining is necessary for the cast iron or mild steel vessels employed. At one time it was thought that good enamelled vessels could only be obtained from foreign makers, but it is pleasing to report that equally good enamelled apparatus is now made in this country. The main defect in enamelled apparatus is its ease of destruction by the dropping of a hammer or chisel or similar article during the process of erection or repairs. Enamel is used because nothing better is available at an economic price.

Workmen's Death at Chemical Works

Asphyxiated by Poisonous Fumes

THE adjourned inquest on Frederick Ost, 72, and Wallace Holmes, 55, who lost their lives at the works of the Sheppey Glue and Chemical Works, Queensborough, Kent, was held on Tuesday. Both men were stated to have been employed by the firm for forty years. Ost had been engaged in cleaning iodine tanks, and Holmes was foreman of the department. On March 5, Holmes was found trying to lift Ost out of the tank, but he, too, was overcome, and two other men who tried to rescue them had to be given oxygen.

George Stevens, works manager and director, said the tank was 4 ft. deep, with 3 in. of solid matter and 9 in. of liquid in it. The installation had been in operation since 1900, and no previous accident occurred. The liquid was siphoned off, and then it was Ost's duty to enter the tank to clean it. Sulphuric acid was first of all added to neutralise the liquid, and, when neutralisation was complete, a little more acid was added and the liquid siphoned to another tank. Later, water was added, and the residue stirred vigourously to make sure that liquor containing iodine was washed away. It was then siphoned into another tank and was distilled for the extraction of crystals. Sulphuretted hydrogen might be given off at the first stages of the process, but not towards the end. The tanks were cleaned out about 30 times a year.

Arthur T. C. Ponton, chemist at the works for 28 years, said that the iodine plant was in existence at the works in 1900. The burnt seaweed was placed into large tanks, and after being evaporated down it left a liquid containing sodium iodine. The liquid was placed into tanks in the still room and neutralised by sulphuric acid which was added slowly. It took a week for the whole process to be gone through and dangerous fumes were given off—sulphuretted hydrogen. They had never had a similar accident or anyone overcome by the fumes, and there were no unusual circumstances on the day in question.

Dr. H. J. Madwar said he was called to the works and found both men dead, so he gave instructions for the other men to be given oxygen and artificial respiration. From the post-mortem examinations he had made both men died from asphyxia through inhalation of sulphuretted hydrogen gas, and there was no sign of drowning in either case.

Francis W. F. Arnaud, Public Analyst to the County of Kent, said he had examined the blood and certain organs of the two men. On March 12 he visited the works and saw the tanks. Strong sulphuric acid was being added to the kelp extract before the accident occurred and the fumes which had evolved through the addition of the acid were let away by appropriate means, and one would have assumed that if time had been allowed between the time the acid was added and the bailing out, no fumes would have been given off. There was no doubt from the death of the men and the condition of other men who looked into the tank, that poisonous fumes were being given off. In such a case, one had to look for abnormalities, and in this case there were two materials which were being used which might have been abnormal. There might have been something new or fresh in the composition of the kelp or a new sulphuric acid was being used. So far as he had been able to ascertain, there were no such abnormal substances. Ost's blood contained a large quantity of sulphuretted hydrogen, but Holmes' did not contain as much. He considered that the tank was not stirred properly on this particular occasion so that the acid was not thoroughly mixed. There was another probability, but it was not very great, and that was that the addition of acid caused large lumps of crystals to form gradually, and it might have been that some of the sulphide was enclosed in the crystals to which the acid had no access. When Ost entered the tank he might have trodden on some and broken them and allowed the gas to come out. In his view, however, the tank was not properly stirred, so that the acid was not entirely mixed with the contents of the tank.

Summing up to the jury, the coroner told them that the only points was whether the firm had done something, or not done something, which made them responsible for the deaths of the two men. In his opinion, this could hardly be called an accident, but more likely misadventure.

The jury returned a verdict of " Death by Misadventure," and added that they would like the platform in front of the tank made wider, so that operations from the outside were made easier. They also placed on record their appreciation of the pluck of the three men who went to the rescue.

The coroner also paid tribute to " the pluck and British grit " of the three men in coming to the assistance of their fellow workmen. They did not think of the danger, but only thought of their workmates who were in difficulties.

Fire-Fighting with Methyl Bromide

Impressive Demonstration and Tests at Richmond

A LARGE assembly of chemical manufacturers and users, fire brigade officers, insurance officials and others associated with exceptional fire risks witnessed a series of demonstrations and tests at the works of the National Fire Protection Co., Ltd., at Petersham Road, Richmond, on March 28, designed to illustrate the superiority of the measures adopted by the company over many commonly-used fire extinguishing media. The programme included quite large-scale fires of petrol, ether, acetone, paraffin wax, rubber, methylated spirits, carbon bisulphide and cellulose, and comparative tests conducted by the company's staff were checked by Mr. L. S. Smith, chief officer of the Wood Green Fire Brigade.

Five exactly similar fires, consisting of three pints of petrol and 2 lb. of wood wool placed in a tray measuring 40 in. by 26 in. (the Air Ministry test fire) were allowed to burn for 20 seconds before being attacked. With a quart pump type carbon tetrachloride extinguisher the fire was out after 52 seconds; with a 2-gal. foam extinguisher it was not out after 57 seconds and with a 2-gal. soda acid extinguisher the fire was still burning after 52 seconds. With a one-pint "Essex" methyl bromide extinguisher the fire was out in 8½ seconds A test with a half-pint " Essex " methyl bromide extinguisher failed owing to a flash back and a second extinguisher succeeded in a total of 16 seconds.

A quart of ether was placed in an open tray 18 in. by 24 in. and attacked upon ignition with a one-gallon "Essex" methyl bromide extinguisher, the fire being out in 3 3/5 seconds. Three exactly similar fires of three pints of acetone were attacked. The first was not out after 43 seconds' use of a quart pump type carbon tetrachloride extinguisher, but was put out by an " Essex " in five seconds; the second was out after 125 seconds' discharge of a 2-gal. foam extinguisher, and the third was out in 7 1/5 seconds with a one-pint "Essex" extinguisher. Six pounds of commercial paraffin wax was melted and ignited and then extinguished in five seconds by means of a No. 5 "Essex" methyl bromide extinguisher.

An old motor car inner tube soaked with petrol was ignited and after the rubber had become well alight it was extinguished in 2 2/5 seconds by means of an " Essex " extinguisher.

Two exactly similar fires consisting of 10 gallons of methylated spirits (61 over proof) in a bath 40 in. by 18 in. were attacked. Three 2-gal. foam extinguishers in succession failed to subdue the flames. The fire was then extinguished by a No. 5 " Essex " in 3 seconds. It was noticeable that the foam was unable to float on the surface of the methylated spirits. In the second test a No. 5 " Essex " methyl bromide extinguisher succeeded in extinguishing the fire in 8 seconds, thus using only one-fifth of its capacity. The total time of discharge of this type is approximately 40 seconds.

Extinguishing a blaze of 20 gallons of Fuel Oil at the demonstration at Richmond on March 28 by means of " Essex " Methyl Bromide Extinguishers

" Essex " Methyl Bromide Extinguisher, No. 5 Model

Two gallons of petrol were allowed to run from a container down a 12 ft. length of open guttering into another can. The whole was ignited and extinguished by a No. 2 "Essex" methyl bromide extinguisher (one-pint) in 5 4/5 seconds, after it had been burning for 10 seconds. The petrol was then re-ignited and extinguished by the same " Essex " in the same time.

Three similar fires each consisting of three pints of carbon bisulphide placed in a tray 18 in. by 24 in. were attacked in turn by (a) quart pump type C.T.C. extinguisher (not out after 52 seconds); (b) two-gallon foam extinguisher (out in 84 seconds); (c) No. 2 " Essex " methyl bromide (one-pint) (out in 6 3/5 seconds).

One-half gallon of cellulose solution was placed in a tray and on the walls of a cellulose-spraying cabinet, which had been previously equipped with an " Essex " No. 5 electrical automatic appliance. This involved a one-gallon extinguisher fastened outside one wall, with two pipes led into the bottom of the side walls. An electrically-operated fusible link was placed inside the cabinet. Two seconds after a lighted match had been thrown in, the report of the electrical operation was heard, and in a further two seconds the fire was entirely

out. The extinguisher continued to discharge for about a minute and the fumes were not unpleasant.

Two exactly similar fires each involving 20 gallons of fuel oil in trays 15 ft. by 6 ft. were ignited by a small quantity of petrol, and attacked as soon as the whole area was alight by (a) three men, each with a two-gallon foam extinguisher (fire extinguished in 70 seconds); and (b) one man with a No. 5 "Essex" methyl bromide extinguisher, and, subsequently, a second man with another similar extinguisher. The fire was extinguished in 48 seconds, leaving one extinguisher half full for use on another occasion.

One gallon of petrol was poured into the five separated bilge compartments of an 18-ft. launch, which had ben previously equipped with a No. 5 "Essex" methyl bromide remote control set, involving a one-gallon capacity extinguisher, with a pipeline separating into five discharge points. 20 seconds after ignition, the lever handle on the bracket was operated and the fire was entirely out in a further 10 seconds.

Co-operation in the Paint Industry

Annual Dinner of the Oil and Colour Chemists' Association

A COMPANY approaching 200 in number attended the seventeenth annual dinner of the Oil and Colour Chemists' Association at the Trocadero Restaurant, London, on March 29. Mr. G. A. Campbell, president, occupied the chair. Among the guests were Sir Frank E. Smith (secretary of the Department of Scientific and Industrial Research, and hon. secretary of the Royal Society), who was accompanied by Lady Smith and Miss Smith; Mr. S. K. Thornley (president of the Research Association of British Paint, Colour and Varnish Manufacturers); Mr. H. J. Jones (hon. treasurer, Paint Federation) and Mrs. Jones; Mr. P. H. Kirkaldy (hon. treasurer, Institute of Chemistry); Mr. W. Macnab (vice-president, Institution of Chemical Engineers); Dr. V. G. Jolly, F.I.C. (chairman, Manchester Section of the Association) and Mrs. Jolly; Mr. H. Gosling (hon. secretary, Manchester Section); Mr. A. H. Whitaker (hon. secretary, Scottish Section) and Mrs. Whitaker; Professor G. I. Finch (Imperial College of Science) and Mrs. Finch.

Sir FRANK E. SMITH, proposing the toast of the Association, congratulated the Association, which was only 17 years old, on having performed some very valuable work, and upon having attained a large membership. In its first year, its membership was less than 100, but it had since grown to something of the order of 900. The Board of Trade returns showed that between 3 and 4 million cwt. of pigments were turned out each year, or about 8 lb. of paint per man, woman and child in the country. What a baby would do with 8 lb. of paint he would leave to the imagination of his hearers; but no doubt the paint would be wasted. He trembled to think what a lady might do with 8 lb. of paint—but he supposed that 80 per cent. of it might be wasted. It seemed that paint was very much like mustard, in that the manufacturers made their money on that which was wasted. When a modern motor car was enamelled by means of the efficient sprays used, some 22 lb. of enamel was required for that car; but it appeared that the amount of enamel which actually stuck to the car was only 2 lb., so that the remaining 20 lb. was wasted. Therefore, even if a lady wasted 80 per cent. when she was doing her work, she was at least as efficient as the modern motor car manufacturers.

Working Hand-in-Hand

The PRESIDENT, in his response, said the members of the Association were grateful to Sir Frank Smith for the encouragement he had given them. After mentioning that the physicists were playing as big a part as the chemists, the president said he liked to visualise the Association treading the same path as the Paint Federation and the Research Association, the three working hand-in-hand in promoting the future well-being of the industries they served. An evil influence still attached to the name "chemistry"; it stretched its arms back through alchemy to black magic, mysterious rites and secret rights; but only nowadays had we learned that secrecy in chemistry was the greatest hindrance to progress. An Association such as this was doing its best work in providing a public platform for the discussion and pooling of knowledge in the interests of true progress. He would define a trade secret as "something we all know, but never talk about." True progress came from the exchange of ideas, and in helping to attain this ideal the Association was doing the best it could for chemistry and was adding to the dignity of the profession of chemistry. The members were pleased to know, from speeches such as that of Sir Frank Smith, that there were others outside the membership who were interested in what the Association was doing and were prepared to give it encouragement and guidance. Those at the helm might be apt occasionally to keep their eyes glued too much to the compass and to miss the distant star which had guided the founders of the Association. The members were anxious to maintain the high ideals that had moved those founders.

Mr. A. J. GIBSON proposed "The guests," and in a tribute to Sir Frank Smith, he said it was sufficient to be reminded that he was a prime mover in bringing together research and industry, and gratitude was due to him for that. To Mr. Thornley, the popular president of the Research Association, he referred as a man of action and few words; and those few words were to the point. Another guest whom he mentioned specially was Mr. Jones, president of the Paint Federation.

Fundamental Work at Teddington

Mr. S. K. THORNLEY responded and, representing as he did the Research Association, he said he had been wondering how the Oil and Colour Chemists' Association and the Research Association could work together even more closely in the future than they had done in the past. There always had been really good co-operation; but he had heard rumours that perhaps there had not been all the co-operation that there might have been. However, he considered that in all the things that really mattered there had been great co-operation. The scientific men had helped to start the Research Association; some of the members of the Oil and Colour Chemists' Association were serving on the Council and on committees of the Research Association, and were doing valuable work. One kind of work which they did, and which was more valuable than any other, was to help to translate into practical applications the results of the fundamental work carried out at Teddington.

The Research Association had its difficulties. It had to consider its members, and could not broadcast all that it did with quite the same broad-minded view as that which the members of the Oil and Colour Chemists' Association could adopt. But it tried to keep in mind that, in addition to its duty to its members, it must have a national outlook and must have regard to the welfare of the public generally. It would always do that, whether or not it was in receipt of a Government grant. Indeed, it could not help benefiting the public, because obviously no-one could benefit from the research work in as great a degree as would the users of the paint. Coming to a consideration of what the Oil and Colour Chemists' Association could do to help the Research Association, he suggested that the members could exert their influence upon firms which were eligible for membership of the Research Association, but which were not within the membership, to join. However efficient an individual organisation might be, and however well it managed to get along, it was working under a handicap if it did not belong to the Research Association; it had certainly something to gain, and absolutely nothing to lose, by joining. Finally, Mr. Thornley commented with pride on the progress which the trade had made, from the scientific point of view, during the last twenty years. There had been an enormous growth, he said, of the scientific or knowledgable management of the business. The trade had become more scientific and efficient, and gave full and satisfactory service to the community as a whole.

Notes and Reports from the Societies

Society of Glass Technology

Specifications for Sands for Colourless Glass

A MEETING of the Society of Glass Technology was held at Stourbridge on March 20, when Mr. Edward Meigh, M.Sc., past-president, was in the chair.

Specifications for raw materials for the glass industry formed the subject of discussion at a meeting of the Society held in Manchester, January, 1933, and since that time the matter had been continually engaging the attention of the Glass Standards Committee of the Society. This committee undertook the preparation of such specifications, turning its attention first of all to sands. The making of colourless glass demanded the use of sand of good quality, both as regards chemical composition and uniformity of grain size, and in view of the widespread production of this class of ware, sand to be used in this branch of the industry was first considered.

Some notes on the spalling characteristics of fireclay bricks was the subject of a paper by Mr. R. E. G. Evers and Mr. J. R. Adderley. The tests reported, though not professing to be exhaustive, seemed to indicate that there was a connection between porosity and spalling, and that a very high percentage of porosity was not an unmixed blessing, even for a brick that was subjected to rapid changes of temperature.

Other papers included "Fireclay Raw Material Characteristics and their Influence on the Finished Brick," by C. A. G. Thomas and J. R. Adderley; "An Examination of Some Lead Crystal Glasses," by Eric Preston and Professor W. E. S. Turner; "Markings and Scratches on the Surface of Glass," by A. J. Holland and Professor W. E. S. Turner.

Forthcoming Papers

A MEETING of the Society of Glass Technology will be held in the Applied Science Department, The University, St. George's Square, Sheffield, on the afternoon of Wednesday, April 10, following the annual general meeting, when the following papers will be discussed: "The Purification of Sands," by F. W. Adams, M.Sc.; "The Effect of the Addition of Small Amounts of Volatile Salts upon the Viscosity and Surface Tension of a Molten Soda-Lime-Silica Glass," by A. E. J. Vickers, M.Sc., F.I.C.

The next meeting of the Midlands Section will be held in the Talbot Hotel, Stourbrige, on Monday, April 15, at 7.30 p.m., when Mr. W. P. Johnson, B.Sc., will present a paper entitled "Some Observations on the Refractory Materials Used in the Flint Glass Industry."

Society of Chemical Industry

London Section : Corrosion-Resisting Non-Ferrous Alloys

DR. H. MOORE, director of the Non-Ferrous Metals Research Association, discussed the present position with regard to corrosion-resisting non-ferrous alloys and their application in chemical industry at the meeting of the London Section of the Society of Chemical Industry on April 1. In the first part of his address, he reviewed broadly the considerations affecting corrosion resistance, classifying them as associated respectively with the alloy and its environment, and he emphasised the high intrinsic resistance to corrosion of several of the chief non-ferrous metals and the capacity of others to protect themselves by thin self-healing continuous surface films, a fact which rendered them of great service in the chemical and food industries.

After stressing the importance of precise knowledge of the conditions of service when assessing corrosion resistance, and making reference to the marked influence of small or unsuspected variations in the corroding medium or in the alloy, Dr. Moore dealt in detail with the chief non-ferrous metals and alloys and some of their applications. He pointed out that in the heavy industries aluminium finds application in the handling of concentrated acetic and nitric acid, adding that completely dehydrated acetic acid will attack aluminium, but a very small trace of water is sufficient to inhibit attack. Similarly, phenols do not attack aluminium provided there is a trace of water present. Copper possesses a high resistance to corrosion by fairly mild acid, alkaline and saline solutions—unless oxygen is present—and by the atmosphere, but this resistance to attack is not dependent upon the purity of the copper. Although oxide film formation is less significant than in the case of aluminium, the formation of oxide and other films materially assists the resistance of copper to corrosion. On the other hand, strong oxidising agents, such as nitric acid, attack copper vigorously. Distilled water containing carbon dioxide attacks copper, whilst the rapid action of ammonia and some similar bodies is due to the solution of copper oxide, etc., and the formation of complex soluble salts.

Extravagant Claims for Copper Alloys

Tin bronzes containing up to 10 per cent. tin are fairly resistant to many types of corrosion and the cupro-nickels show excellent resistance to corrosion. The true aluminium bronzes—alloys of copper with 3 to 10 per cent. of aluminium—very readily protect themselves with a more or less continuous film of aluminium oxide and they are used in chemical enginering to resist many kinds of oxidising conditions. An alloy of approximately 9 per cent. aluminium and 3 per cent. iron, with copper, was stated to offer very good resistance to phosphoric acid, hydrofluoric acid, acetic acid, caustic soda and potash, saturated sulphate of ammonia solution, sulphuric acid, over a wide range of concentration and temperatures, sea water, etc. Remarking that these claims by those concerned were modest, Dr. Moore expressed regret that in view of the established corrosion-resisting properties of the copper alloys, extravagant claims are sometimes made.

The rapid extension of the use of magnesium as a material of construction was commented upon, and although, generally, this is not regarded as having a high corrosion resistance some of the elektrons have shown remarkable resistance to corrosion by alkalis and hydrofluoric acid solutions. Nickel finds its chief application in chemical industry for resistance to alkalis, but as it is a relatively expensive metal it is suggested that economy may be secured by employing nickel-clad steel. Moreover, nickel promotes corrosion-resistance in many of its alloys, and monel metal finds numerous applications for resistance to severely corrosive conditions, as in sulphate of ammonia manufacture, in the dyestuffs and dyeing industries, and for pickling equipment where the pickling agent is sulphuric acid.

Speaking of laboratory tests, Dr. Moore emphasised the importance of the correlation of results so obtained with service results, and urged those in possession of information of this kind to make it generally available whenever possible. Published information of this type, on the resistance of materials to corrosion, is very incomplete.

Society of Public Analysts

Forthcoming Papers

A MEETING of the Society of Public Analysts was held on Wednesday, April 3, at the Chemical Society's Rooms, Burlington House, Piccadilly, London, at 8 p.m., when the following papers were read: "Commercial Ground Almonds and their Adulteration" (G. N. Grinling, F.I.C.); "The Application of Analysis to the Study of Liesegang Rings" (E. B. Hughes, M.Sc., F.I.C.); "The Detection of Japanese Oil in other Peppermint Oils" (D. C. Garratt, B.Sc., Ph.D., F.I.C.); "Measurement of the Small Volumes of Nitrogen obtained by the Micro-Dumas Method" (H. C. Gull, M.Sc.)

THE South African perfumery manufacturers are seeking tariff assistance, but it still remains to be seen whether it will be granted. They recommend a rebate on the essential oils and fixatives used in the manufacture of perfumes, bay rum and other toilet waters; on blossoms and herbs not produced commercially in the Union; and the free admission of glassware containers. They are also seeking exemption from excise duty of the spirit used in the manufacture of ammoniated and bath eau-de-cologne, and that the excise duty be levied per bulk gallon on perfumes, bay rum and other toilet waters.

Ideal Home Exhibition

Progress of Chemistry and Biology

MORE than five hundred well-known British firms are participating in the "Daily Mail" Ideal Home Exhibition which opened at Olympia on Tuesday and continues until April 18, and although the chemical industry takes no organised part in the exhibition there is scarcely a section throughout Olympia that does not bear testimony, direct or indirect, to its service to the community and the progress and improvement of its products. Plastics, stainless steels, paints, polishes, food and cookery, water softening, refrigeration, building materials, beauty preparations, emulsifiers, air purification and a hundred and one other aspects of the exhibition owe much to the enterprise of the chemical industry.

Mural paintings surrounding "Jubilee City" in the grand hall, believed to be the largest of their kind ever commissioned in the history of modern art, represent the progress of civilisation during the past twenty-five years. Groups of famous men in science and industry include Lord Hirst, Professor E. V. Appleton, Sir Joseph Petavel, Sir Ambrose Fleming, Sir William Pope, Sir Arthur Duckham, Dr. Herbert Levenstein, Sir Richard Redmayne, Lord Moulton, Sir Robert Hadfield, Sir Henry Fowler, Sir Alfred Ewing, Sir John Cadman and Sir Dugald Clerk. One panel is devoted to chemistry and biology. Among the brilliant company here portrayed are H. de Vries, Dutch botanist; J. B. S. Haldane, with open book; above them, Dr. Carl Bosch, Professor W. Ostwald and Professor W. A. Bone; and higher, Professor Fritz Haber, Professor F. Soddy, and Professor T. H. Morgan, the American biologist. Professor Julian Huxley is seated on the right, F. Bergius, the German chemist, holds a stereoscope. Paul Sabatier (France), Irving Langmuir (United States), Dr. Johannes Schmidt and Luther Burbank complete the front row. The five above are Dr. E. D. Adrian, R. Willstatter (Germany), Sir F. Gowland Hopkins, Sir James Dewar and Dr. E. F. Armstrong. Other paintings deal with the progress of medicine, building, physics, civil engineering, agriculture and education.

The most renowned new house in the world is shown—the King's House—a faithful replica in full size, of the residence into which all the Royal Warrant Holders are putting all their greatest art for presentation to His Majesty as a Jubilee tribute. There are 200 locks in the house, hand-made and pick-proof, in the doors, cupboards, cocktail cabinet, piano and so on. The Master of the House has a master key, concealed in his signet ring, which opens every lock except those belonging especially to his lady. She, in her turn, has a master key in a gold locket, to fit all locks except those specially his. Each servant has one key to work only those locks appropriate to his or her position.

Novel Features of Boots Factory

Extensions at Beeston

WORK has already begun on clearing the site for the new factory for Boots Pure Drug Co., Ltd., which, as previously announced in THE CHEMICAL AGE, is to be erected immediately adjoining the up-to-date factory erected at Beeston, Nottingham, in 1933. The existing factory accommodates all the processes in the manufacture and dispatch of "wet goods"—*i.e.*, liquid medicines, oils, creams, pastes, etc. The new factory, which, like the present one, has been designed by Sir E. Owen Williams, in co-operation with Boots Works Planning Committee, will house the dry products—*i.e.*, powders, pills, lozenges, tablets, etc. The whole structure, built of concrete and steel, with glass walls and roof, will measure 600 ft. by 400 ft., and will cost £550,000.

One of the most striking features of the building is that the outer portions, in the form of low horizontal wings of glass and concrete, will be mainly suspended from the centre block, instead of being supported on their own pillars. The flow of material from left to right through the building will thus be practically uninterrupted by internal pillars. One detail illustrates the care devoted to the planning—the windows will be protected from high-angle sun glare by projecting concrete ledges. The first unit of the new factory is scheduled to be finished by March, 1936, and it it expected that the installation of the machinery will be completed by the beginning of the summer.

Personal Notes

MR. ARTHUR LINZ has resigned from the board of the Indestructible Paint Co.

MR. W. C. BESCHORMAN has been appointed director of Goodlass Wall and Lead Industries.

THE HON. FRANCIS JAMES RENNELL RODD has been appointed a director of Courtaulds, Ltd., from March 28.

MR. G. A. CONTOMICHALOS has resigned his directorship of Sudan Salt, Ltd.

MR. D. N. LOWE, of Arbroath, has been appointed assistant secretary in London to the British Association for the Advancement of Science.

MR. HENRY GILMAN, of Birmingham, and Hockley Heath, joint managing director of Joseph Gilman and Son, Ltd., oil and colour merchants, who died on December 23, left £21,500, with net personalty £5,890.

DR. JAMES CHADWICK, Fellow of Caius College, Cambridge, and one of the most brilliant of the younger physicists in this country, is to succeed Professor L. R. Wilberforce to the Lyon Jones Chair of Physics in the University of Liverpool.

DR. C. W. MONIER-WILLIAMS and Professor J. W. Munro have been appointed to the special committee of the Medical Research Council to advise and assist in further investigations into the health problem caused by the infestation of houses by the bed-bug.

SIR THOMAS BELL is relinquishing the office of managing director of John Brown and Co., Ltd., as from April 2. Sir Thomas, however, will retain his seat on the board. Mr. Stephen J. Pigott, who was recently elected to the board, has been appointed resident director-in-charge at Clydebank.

HONORARY DEGREES are to be conferred by the Liverpool University on Dr. Nevil V. Sidgwick, the president-elect of the Chemical Society, Mr. Charles Thurstan Holland, formerly radiology lecturer at Liverpool University, and Professor Arthur Harden, late director of biochemistry, Lister Institute.

MR. DAVID M. PAUL and Mrs. E. Soutar Paul were honoured by a dinner given by the Chemical Section of the Manchester Literary and Philosophical Society at the Grand Hotel, Manchester, on March 29. Mr. Paul, who has been hon. secretary of the chemical section for about twelve years, was presented with an inscribed cigarette case and books.

MR. CHARLES B. O. CLARKE, a former director of the Powell Duffryn Steam Coal Co., Ltd., and of Stephenson-Clarke and Associated Companies, died on March 29, at his home, Wiston Park, Steyning, Sussex, following a heart attack. He had been associated with the Powell Duffryn Co. for over 50 years and was elected a director in 1909. He retired from the board of directors early last year.

German Mineral-Earth Pigments

Export Trade Encounters Difficulties

THE Farbwerke Franz Rasquin A.G., of Cologne-Mulheim, leading German manufacturer of pigments from mineral earths, in a recent report stated that owing to increased domestic trade, the firm had achieved a profit for the first time in many years. Trade expansion was occasioned by Government subsidies granted home owners for the repair and improvement of buildings. Sales were particularly brisk in the spring, when the granting of subsidies was at its peak, but fell off during the latter part of the year with suspension of subsidies. Export trade encountered difficulties owing to import restrictions in foreign countries, but German exports of iron oxides for the first ten months of 1934 advanced to 8,943 tons from 8,000 tons for the corresponding period of 1933. Leading markets and increases were Belgium, to 1,215 from 1,164 tons; Great Britain, to 1,202 from 1,119 tons; Denmark, 540 from 398 tons; Italy, 500 from 288 tons; Netherlands, 697 from 563 tons; Sweden, 888 from 708 tons; Switzerland, 302 from 299 tons; and United States, 441 from 343 tons. In contrast with the favourable showing for iron oxide, German exports of sienna, umber, and other earth pigments continued to decline, dropping to 6,882 tons during the first ten months of 1934 from 8,133 tons for the corresponding period of 1933.

News from the Allied Industries

Tanning

NEGOTIATIONS ARE NEARING COMPLETION for the acquisition by Barrow, Hepburn and Gale, Ltd., of Thomas Holmes and Sons, tanners, of Hull, who have been established nearly 80 years.

Cocoa Butter

IT WAS ANNOUNCED at a meeting of the Hull Development Committee on March 27 that the Dutch firm of Kamphuys and Oly had secured a site with a riverside frontage, where new mills will be built for the manufacture of cocoa butter from cocoa beans shipped from West Africa.

Artificial Silk

COURTAULDS, LTD., are planning to erect a new factory in or near Bridgwater, Somerset, at a cost of approximately £250,000. The plans of the company have been explained to the Bridgwater Town Council, who have stated their readiness to meet the company with regard to the provision of an adequate water supply and houses for the large staff of employees required.

Beet Sugar

STATE ASSISTANCE in the beet sugar industry was discussed by Lord Eltisley at Bury St. Edmunds on April 1. It had been rumoured that, owing to the decline of world sugar prices to such an uneconomic level, it would not be desirable to continue the subsidies on English-grown sugar-beet and that all help of that kind was to be withdrawn. Major Dorman Smith, vice-president of the National Farmers' Union, said that if the beet sugar industry had to struggle for its existence it could rely on the full support of the National Farmers' Union. Mr. R. T. Kirkwood, managing director of the Bury St. Edmunds factory, suggested that if there were no sugar subsidy a further million acres of arable land would go down to grass.

Non-Ferrous Metals

FINAL AGREEMENT on a six-point programme for stabilising the foreign production of copper has been announced at the International Copper Conference, in New York. The agreement includes the curtailment by 240,000 tons annually of the present production of copper, which will be made effective by June 1; an organisation which has been created to compile complete statistical information; and co-operation in the foreign markets with producers other than those taking an active part in the conference.

Rubber

SEVERAL TONS OF RUBBER were destroyed by fire on April 1 at the works of the Hooley Hill Rubber and Chemical Company, Audenshaw. The firm is largely engaged in the manufacture of rubber pavements, and the large quantity of inflammable material in the sheds and the rubber dump made ready fuel for the flames. Ashton Fire Brigade sent two engines and succeeded in confining the damage to the two sheds. Work proceeded in other parts of the premises during the fire.

A SUBSTANTIAL INCREASE in the demand for liquid rubber as a result of its growing use as a manufacturing material was reported by Dr. D. F. Twiss, chief chemist at Fort Dunlop, in the course of a lecture delivered on April 1 to the Royal Society of Arts, London. As a result of the development of the processes of manufacture, the dry content of rubber latex exported from plantations in Malaya and the Dutch East Indies has increased from 5,800 tons in 1931 to nearly 20,000 tons last year, and the increase is being maintained.

SIR STEPHEN KILLIK on March 27 laid the foundation stone of the new Rubber Exchange in Fenchurch Street. The new Exchange will cover 41,074 square feet, and in point of superficial area will be the second largest building in the City of London. The building will have frontages on Fenchurch Street, Eastcheap, Mincing Lane and Rood Lane.

Continental Chemical Notes

Switzerland

IMPORTS OF CHEAP ITALIAN RAYON are hampering the Swiss rayon industry. The Feldmühle rayon factory is severely restricting output.

Spain

A NEW PYRITES DEPOSIT in Huesca is being worked by the Sociedad La Industrial Quimica, of Saragossa, to provide material for the fertiliser factory in that town.

Poland

EFFORTS TO IMPROVE THE POSITION of the 350 turpentine factories have been renewed. Price regulation and establishment of district sales organisations are among the objects in view. Only 15 to 20 per cent. of the turpentine production is exported.

France

RATIFCATION OF THE DECREE for increasing the camphor duty was discussed recently in the Chamber of Deputies. Synthetic camphor, it was stated, is no longer produced in France, the two original factories having closed down in the face of foreign competition. Although a home production of 400 to 600 tons synthetic camphor would call for 800 to 1,000 tons of turpentine and thus benefit the French rosin industry, the duty would entail hardships for the celluloid industry, working as it is under considerable difficulties. Attempts to re-establish the synthetic camphor industry might- incidentally, drive celluloid manufacturers to resort to other plasticisers and also encourage the importation of borneol, a convenient starting-point for camphor synthesis.

Belgium

MANUFACTURE OF BLACK COPPER OXIDE has been commenced by the Metallo-Chimique Co., of Beersse.

Hungary

A VISCOSE RAYON FACTORY is under consideration, involving a capital outlay of 4 million pengoes.

MANUFACTURE OF HYDROSULPHITES has been embarked upon by the Count Ludwig Batthany Chemical Co. (capital 150,000 pengoes). The selling agents are the Rex Pharmaceutical Chemical Co., of Budapest.

Germany

AMONG THE OIL-DRILLING SCHEMES being fostered by the government in numerous localities, one of the most ambitious is that recently inaugurated by the Friedrich Wilhelm Mining Co. in the vicinity of Munster, in Ascheberg, where the conditions are believed to resemble those in the Pennsylvania oil field. Deep-drilling equipment capable of penetrating to a depth of 10,000 feet will probably be required.

Czecho-Slovakia

CONTINUING ITS POLICY OF EXPANSION the Ossig Union has now entered into a close working arrangement with the Medica Co., of Prague (share capital 4 million Kronen), manufacturers of chemical and therapeutic preparations. The Ossig Union now controls two-thirds of the Czech glue production and the whole of the gelatine production. The only other concerns producing glue on a considerable scale are the Koliner Fertiliser Co. and J. D. Starck, of Kasehau.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Complete Specifications open to Public Inspection

DYEING PELTS, hairs, and feathers.—I. G. Farbenindustrie. Sept. 20, 1933. 19903/34.

DYEING AND PRINTING.—H. T. Böhme A.-G. Sept. 22, 1933. 23468-9/34.

VALUABLE LIQUID HYDROCARBONS by the destructive hydrogenation of solid carbonaceous materials, production.—International Hydrogenation Patents Co., Ltd. Sept. 19, 1933. 24716/34.

CHEMICALLY-PURE STARCH, and method of purification and separation of same.—Wisconsin Alumini Research Foundation. Sept. 22, 1933. 25338/34.

ABSORPTION OR RE-ABSORPTION OF VAT DYESTUFFS and sulphur dyestuffs by the fibre, retarding.—Soc. of Chemical Industry in Basle. Sept. 19, 1933. 26187/34.

N-SUBSTITUTION PRODUCTS of alpha-amino-anthraquinone and its derivatives.—I. G. Farbenindustrie. Sept. 19, 1933. 26535/34.

INDIGOID VAT DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Sept. 22, 1933. 26941/34.

PRINTING WOOL.—Soc. of Chemical Industry in Basle. Sept. 23, 1933. 27065/34.

DIAZO PREPARATIONS.—Soc. of Chemical Industry in Basle. Sept. 25, 1933. 27066/34.

STABILISATION OF MOTOR FUELS.—E. I. du Pont de Nemours and Co. Sept. 21, 1933. 27211/34.

DEVELOPING OF DYEINGS on the fibre.—Deutsche Hydrierwerke A.-G. Sept. 21, 1933. 27230/34.

AMINONITRILE, production.—Ges. für Kohlentechnik. Sept. 21, 1933. 27231/34.

PRECIPITATED CALCIUM CARBONATE, production.—Union Chimique Belge Soc. Anon., and J. Guillisen. Sept. 23, 1933. 27299/34.

HYDROXY ACIDS AND LACTONES, manufacture.—E. I. du Pont de Nemours and Co. Sept. 22, 1933. 27434/34.

HALOGENOALKYLSULPHONIC ACIDS, manufacture.—E. I. du Pont de Nemours and Co. Sept. 22, 1933. 27435/34.

NITRIC ACID, apparatus suitable for the production.—E. I. du Pont de Nemours and Co. Feb. 24, 1933. 9300/35.

Specifications Accepted with date of Application

ANÆSTHETICS for hypodermic injection.—A. H. Stevens (Novocol Chemical Mfg. Co., Inc.). June 15, 1933. 425,678.

ACTIVATED CARBON and apparatus therefor, production.—F. H. Cone and C. B. Houlder. June 24, 1933. 425,891.

LUBRICATING OILS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). July 17, 1933. 425,893.

DESTRUCTIVE HYDROGENATION of carbonaceous materials.—R. Holroyd, C. Cockram and Imperial Chemical Industries, Ltd. July 19, 1933. 425,679.

WASHING, WETTING, DRESSING, and the like agents, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Aug. 14, 1933. 425,680.

DYES HAVING A METHINE or polymethine linkage, production and use.—J. D. Kendall. Sept. 12, 1933. 425,609.

ACTIVATED CARBON from powdered coal, peat, and like carbonaceous materials, process of and apparatus for producing.—R. W. Easton. Sept. 13, 1933. 425,611.

HEAT-RESISTING ALLOYS.—H. W. Brownsdon and Imperial Chemical Industries, Ltd. Sept. 15, 1933. 425,614

CUPROUS CHLORIDE, production.—E. I. du Pont de Nemours and Co. Sept. 19, 1932. 425,620.

MINERAL HYDROCARBON PRODUCTS, process of treating.—B. A. Stagner. Sept. 20, 1933. 425,623.

ALUMINIUM FLUORIDE and the double fluorides of aluminium and ammonium, production.—British Aluminium Co., Ltd., W. E. Sims, S. F. Derbyshire, and E. J. Bloore. Sept. 20, 1933. 425,908.

ALUMINIUM FLUORIDE, production.—British Aluminium Co., Ltd., W. E. Sims, S. F. Derbyshire and E. J. Bloore. Sept. 20, 1933. 425,693.

CHLORINATED RUBBER, production.—Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler. Sept. 27, 1932. 425,769.

AZO DYESTUFFS insoluble in water, manufacture.—I. G. Farbenindustrie. Sept. 24, 1932. 425,839.

THIOINDIGO DYESTUFFS, manufacture.—E. I. du Pont de Nemours and Co. Sept. 22, 1932. 425,841.

MASSES SIMILAR TO SOFT RUBBER, manufacture and production. J. Y. Johnson (I. G. Farbenindustrie). Oct. 7, 1933. 425,843.

1-CHLOR-2-METHYL-ANTHRAQUINONE, production.—I. G. Farbenindustrie. May 16, 1933. 425,774.

ANTI-CORROOSIVE COATINGS, production.—K. E. H. Rodwell. Dec. 12, 1933. 425,848.

AMINES, hydrogenation.—W. W. Triggs (Röhm and Haas Co.). Jan. 2, 1934. 425,927.

COMPOUNDS OF THE ANTHRAQUINONE SERIES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). April 3, 1934. 425,854.

HYDROCARBON OILS, cracking.—Standard Oil Co. May 3, 1933. 425,726.

GLYCOL ETHERS, method of preserving.—Carbide and Carbon Chemicals Corporation and H. L. Cox. May 8, 1934. 425,728.

RECOVERING DRY PRODUCTS from liquids such as solutions or emulsions, process.—G. A. Krause and Ges. für Linde's Eismaschinen A.-G. May 9, 1934. 425,729.

WASHING AGENTS, preparation.—H. T. Böhme A.-G. July 28, 1933. 425,804.

SULPHONIC ACIDS, production.—H. Flesch, C. Flesch, and L. E. Abelmann (trading as Farbund Gerbstoff-Werke C. Flesch, Jr.). May 29, 1933. 425,942.

ZINC OXIDE, treatment.—S. Percival (W. Grillo Handelges.). June 29, 1934. 425,664.

LUBRICATING OILS by the heat-treatment of solid carbonaceous materials in presence of hydrogenatory gases, production.—International Hydrogenation Patents Co., Ltd. Aug. 15, 1933. 425,814.

Applications for Patents

(March 14 to 20 inclusive.)

CONDENSATION PRODUCTS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Oct. 2, 1933. 425,370.

CONDENSATION PRODUCTS from alcohols and phenols, manufacture.—British Industrial Solvents, Ltd., H. Langwell and E. E. Connolly. Oct. 17, 1933. 425,373.

FERTILISING SALTS.—H. Grah. Nov. 29, 1932. 425,326.

ORGANIC SALTS OF BISMUTH, production.—Boot's Pure Drug Co., Ltd., F. L. Pyman, and A. P. T. Easson. Jan. 2, 1934. 425,387.

DYEING LEATHER, process.—Soc. of Chemical Industry in Basle. April 22, 1933. 425,433.

LUBRICATING AND LIKE OILS.—Standard Oil Development Co. Oct. 3, 1933. 425,569.

HIGH MOLECULAR ACETALS, process for making.—H. Flesch, C. Flesch, and L. E. Abelmann (trading as Farbund Gerbstoffwerke C. Flesch Jr.). May 12, 1933. 425,396.

COMPOUNDS OF THE PYRIDINE SERIES, manufacture.—Chemische Fabrik von Heyden A.-G. May 27, 1933. 425,435.

SUBSTITUTED BARBITURIC ACIDS, manufacture.—Chemische Fabrik von Heyden A.-G. June 3, 1933. 425,570.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Sept. 20, 1933. 425,517.

DYEING ACETATE ARTIFICIAL SILK, process.—Soc. of Chemical Industry in Basle. Sept. 20, 1932. 425,450.

TANNING SUBSTANCES, manufacture.—J. R. Geigy, A.-G. Sept. 16, 1933. (Addition to 375,160.) 425,527.

2-ACETYLAMINO-3-CHLORANTHRAQUINONE, manufacture and production.—I. G. Farbenindustrie. Sept. 20, 1933. 425,456.

SULPHURETTED POLYMERISATE OF ACRYLIC ACID, its derivatives, or homologues, methods of producing.—British Thomson-Houston Co. Oct. 24, 1933. 425,466.

AZO DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle and A. G. Bloxham. July 8, 1933. 425,357.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

France.—An agent of British nationality established at Paris wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemicals and raw materials for the paint, wallpaper and rubber industries; aluminium and bronze powders. (Ref. No. 298.)

Spain (Canary Islands).—An agent established at Teneriffe wishes to obtain the representation, on a commission basis, of United Kingdom exporters of motor oils. (Ref. No. 301.)

Egypt.—The Commercial Secretary to the Residency reports that the Egyptian Ministry of Agriculture is calling for tenders, to be presented in Egypt by May 2, 1935, for the supply of nicotine sulphate, zinc phosphide, Meritol, sulphur, copper sulphate and Volck. Further particulars of this call for tenders have been communicated by the Department of Overseas Trade to firms whose names are entered on its Special Register. (Ref. F.Y. 2278.)

Argentina.—A firm in Buenos Aires wish to obtain, on a commission basis, the representation of United Kingdom manufacturers of heavy chemicals and medicinal drugs. (Ref. No. 307.)

Weekly Prices of British Chemical Products

Review of Current Market Conditions

PRICES of a number of pharmaceutical and photographic chemicals have shown slight alterations during the week, but there are no changes to report in the prices of general heavy chemicals, rubber chemicals, wood distillation products, coal tar products, essential oils and intermediates. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

Pharmaceutical and Photographic Chemicals.—IRON AMMON. CITRATE, B.P., 2s. per lb.; POTASS. BITARTRATE 99/100% (cream of tartar), 79s. per cwt.; CITRAL, 9s. per lb.; ETHYL PHTHALATE, 2s. 3d. per lb.

All other prices remain unchanged.

LONDON.—The demand for chemicals generally is still maintained, but there has been no change in prices. Conditions in the coal tar products market remain unchanged.

MANCHESTER.—In common with most other sections the nervousness caused by international uncertainties has been less in evidence on the Manchester chemical market during the past week, and the tone has been somewhat brighter. Actual trading conditions, however, have remained rather patchy, and so far as new contract bookings are concerned these have been both few in number and have covered relatively small quantities. There has been no marked contraction in the aggregate deliveries of the principal heavy materials, although both the cotton and woollen textile trade are slow to display any noticeable improvement and this is reflected in the quantities of dyeing and finished chemical that are being taken up. In most other directions, however, delivery conditions are fairly satisfactory and are certainly no worse than they have been during the first quarter. Prices are generally steady and little actual weakness can be reported this week.

SCOTLAND.—The main business in the Scottish heavy chemical market at the present time is the demand for sulphate of ammonia and this product is extremely scarce at present other than through combine suppliers.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. less 21%. MANCHESTER: 11¾d.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works. full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 0¾d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE. SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 2d. per lb.; crimson, 1s. 5d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 10s., ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—2s. 4d. to 2s. 8d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4¼d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 21%. LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½%.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £32.

LEAD NITRATE.—£27 10s. per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—30%, £17 to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—7½d. to 8¼d. per lb. for delivery up to December 31.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 to £40.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99½/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NIRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 10½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10½d. to 10¾d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.
SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r in bags.
SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON: £22. SCOTLAND: £20.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lot less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 10s. per ton.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.
SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM NITRITE.—LONDON. Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—10%, 9½d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.
SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.
SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £14 to £14 5s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—11d. to 1s. per lb.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
p-CRESOL 34-5° C.—2s. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3ss. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. to 11d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 to £10. Grey, £12 to £14. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £11; grey, £13 10s.
ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.
AMYL ACETATE, TECHNICAL.— 95s. to 110s. per cwt.
CHARCOAL.—£5 15s. to £10 per ton.
WOOD CREOSOTE.—Unrefined, 3d. to 1s. 6d. per gal.
WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 6d. to 4s. per gal.
WOOD TAR.—£2 to £4 per ton.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 7¾d. to 8¼d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¾d. per lb.; crude, 2s. to 2s. 1d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
BENZOL.—At works, crude, 8½d. to 9d. per gal.; standard motor, 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 6½d. to 1s. 7d. LONDON: Motor, 1s. 5½d. SCOTLAND: Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 5½d. to 5¾d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4¾d. to 5½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4½d. to 4¼d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 2½d. to 1s. 3½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—Medium soft, 42s. to 45s. per ton. LONDON: 45s. per ton, f.o.b. East Coast port.
PYRIDINE.—90/140, 6s. to 8s. 6d. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 1d. to 2s. 2d.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—£7 5s. per ton; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.
CYANAMIDE.—£7 5s. per ton delivered in 4-ton lots to farmer's nearest station.
NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935, in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.
NITRO-CHALK.—£7 5s. per ton to June, 1935, in 6-ton lots carriage paid for material basis 15.5% nitrogen.
CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery up to June, 1935, in 6-ton lots carriage paid.
NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton.

Latest Oil Prices

LONDON, April 3.—LINSEED OIL was firm. Spot, £22 10s. (small quantities), April, £20; May-Aug., £20 10s.; Sept.-Dec., £21, naked. SOYA BEAN OIL was inactive. Oriental (bulk), April/May shipment, £21 15s. per ton. RAPE OIL was slow. Crude, extracted, £32; technical refined, £33 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £25; refined common edible, £28 10s.; and deodorised, £30 10s., naked, ex mill (small lots, 30s. extra). TURPENTINE was quiet. American, spot, 47s. per cwt.

HULL.—LINSEED OIL, spot, quoted £20 12s. 6d. per ton; April, £20 5s.; May-Aug., £20 12s. 6d.; Sept.-Dec., £20 17s. 6d. COTTON OIL.—Egyptian, crude, spot, £24 10s.; edible, refined, spot, £27; technical, spot, £27; deodorised, £29, naked. PALM KERNEL OIL, crude, f.m.q., spot, £19 10s., naked. GROUNDNUT OIL, extracted, spot, £31 10s.; deodorised, £34 10s. RAPE OIL, extracted, spot, £31; refined, £32 10s. SOYA OIL, extracted, spot, £24 10s.; deodorised, £27 10s. CASTOR OIL, pharmaceutical, 40s. 6d. per cwt.; first, 35s. 6d.; second, 32s. 6d. COD OIL, f.o.r. or f.a.s., 25s. per cwt., in barrels. TURPENTINE, American, spot, 49s. per cwt.

From Week to Week

SEVEN WORKMEN WERE KILLED, and many injured, by an explosion of a hydrogen reservoir in a chemical fertiliser factory at Konan, Korea, on April 2.

THE OIL INDUSTRIES CLUB held its monthly luncheon on Tuesday, when the speaker was Mr. Adrian Corbett. His address was on the subject "Oil Policy and Publicity."

A PROPOSAL HAS BEEN MADE for the establishment in Birmingham of a national foundry school, which would be aided by the British Cast Iron Research Association and would have the support of the Board of Education.

THE NOMINAL CAPITAL of Agricultural and Public Contractors, Ltd., chemical manure and fertiliser manufacturers, Maidenhead, has been increased by the addition of £500 in £1 ordinary shares beyond the registered capital of £500.

METAL INDUSTRIES, LTD., a subsidiary of British Oxygen, Ltd., has acquired the Cunard-White-Star liner "Mauretania" for breaking-up purposes. The purchase price has not been divulged, but her breaking-up value has been estimated at £80,000.

DETAILS OF THE SCHEME for a gas grid for Lanarkshire and Renfrewshire have been sent to the concerns involved by the Board of Trade. The report is confidential, but it assumes that extra supplies of gas will be available for distribution through the modernisation of their furnaces by William Dixon, Ltd., Glasgow, and William Baird and Co., Gartsherrie, Coatbridge.

SEVEN WORKMEN WERE KILLED and 30 injured in an explosion at the Allemandi gun-powder factory at Avigliana on April 1. The explosion was caused apparently by spontaneous combustion, when chemicals were being dried in a special vat. Four other vats in a nearby shed were demolished and several small buildings, part of the general plant, but separated by wide ditches, were damaged.

THE ANGLO-CHILEAN NITRATE CORPORATION (Cia Salitrera Anglo-Chilena), now one of the three principal companies entitled to share in the balance of profits declared by the Chilean Nitrate and Iodine Sales Corporation after the satisfaction of the agreed prior claims of the Government, bond-holders and banks, has issued its accounts for the year ended June 30, 1934. These show gross profits of £505,401, including £386,777 profit on nitrate sales. General expenses account for £282,159 and interest charges for £767,904. After sundry debit and credit adjustments, there is a net deficit of £626,991.

THE PRODUCTION OF "LIQUID COPPER" is stated to have been achieved by two American scientists. They are Mr. L. D. Pangborn and Mr. Harry Sweney, who are said to have found the solution of the problem of breaking down elemental copper into an amorphous form, suitable for mixing into a paint-like substance which resists corrosion. The process will be used in the manufacture of non-crystalline "copper-dust" as soon as a factory can be completed at Chicago. The new amorphous pigment is expected to have many commercial uses, particularly in the production of corrosion-resisting paints.

INTERNATIONAL COMBUSTION LTD. (Grinding, Screening and Filtering Division) report having received recent orders for England covering two 150 sq. ft. Rovac filters with pumps, 34 ft. dia. Hardinge thickener and superstructure for a flue gas washing plant; No. 1 Raymond screen pulveriser and accessories for grinding gums and resins; 2-3 ft. dia. Raymond vacuum air separating plants for handling micaceous oxide and charcoal. Orders for abroad include 4 ft. 6 in. by 16 in. and 3 ft. by 28 in. Hardinge ball mills for grinding gold ore; 4 ft. by 5 ft., 1 sur. type 70, and 4 ft. by 8 ft., type 400, Hummer electric screens for screening gold ore; four 4 ft. by 8 ft., and two 4 ft. by 5 ft., types 400 and 70, Hummer electric screens for screening coal—this is a repeat order.

THE PALLIVASAL HYDRO-ELECTRIC PROJECT of the Travancore State is nearing completion and is expected to supply electric power at the cheapest possible rates. Serious attention is, therefore, being given by the industrialists in the State to the proposals to start chemical industries, especially the manufacture of artificial manures. Another project, which it is believed will be undertaken by the State itself in the beginning, is for the manufacture of paper for which, according to a recent investigation of the Forest Department, abundant raw material is available. It is stated that a large scale factory of an output of about 6,000 tons a year, can be easily and profitably run with the new electric power.

MELDRUMS, LTD., Timperley, have received an order for a large addition to their destructor plant for the Haifa Municipality.

A PRICE LIST of beakers and flasks in highly-resistant glass, stocked and supplied by J. W. Towers and Co., Ltd., has recently been issued.

DETAILS of the Fourth International Technical and Chemical Congress of the Agricultural Industries to be held in Brussels on July 15-28, 1935, are now available in English and may be obtained from Mr. W. E. Callingha, 2 Thames House, E.C.4.

JAPANESE PRODUCTION of rayon yarn in February was 13,638,470 lb., an increase of 517,350 lb. on January, and the highest monthly total yet recorded. In February, 1934, production was 9,163,300 lb., a record figure up to that date.

HULETT'S SOUTH AFRICAN REFINERIES, LTD., announces its intention of redeeming the outstanding balance (£435,600) of the 6½ per cent. first mortgage debentures on July 1 next, at 103 per cent. For the purpose of this redemption, the company has created an issue of £450,000 4½ per cent. first mortgage sterling debenture stock.

THE JOURNAL OF THE ROYAL TECHNICAL COLLEGE, Glasgow, for January, 1935, contains articles on "A Study of the Gattermann Hydroxy-Aldehyde Synthesis," "Aldehyde-Phenyllydrazone Sulphonic Acids," "Experiments in Inert Dust used in Coal Mines," and "The Bactericidal Action of Ultra-Violet Light."

FORTY-FIVE STUDENTS of the Manchester College of Technology left Manchester on March 31 for a tour of the industrial Rhineland. The chemists of the party will visit the Rhenish camphor works; Henkel's chemical factories, and the textile section spinning and weaving mills in the district. The whole party will go to the Krupp works at Essen, to Cologne, and farther up the river to Coblenz.

THE CHEMICAL AGE LAWN TENNIS TOURNAMENT

Lawn tennis players in the chemical industry are reminded that entry forms, rules and full details of the fifth annual CHEMICAL AGE Lawn Tennis Tournament may now be obtained on application to The Editor, THE CHEMICAL AGE, Bouverie House, 154, Fleet Street, London, E.C.4.

All entries must be received by April 19, and there is no entrance fee. Early application for entry forms will facilitate the arrangements for the Tournament.

Particulars of the Tournament appeared in THE CHEMICAL AGE last week (page 295).

A GIFT OF £10,000 has been received from Mr. G. Albert Thomson, managing director of Brown Bros. and Co., Rosebank Ironworks, Edinburgh, to establish a commercial laboratory in Edinbugh University. It will enable the most approved methods of training students for a commerce degree to be introduced, and will provide for the immediate requirements in staff and equipment for such a laboratory.

ILFORD, LTD., has acquired the majority interest in Spicer-Dufay (British), Ltd., which company has the manufacturing and selling rights of Dufaycolor photographic film throughout the British Empire. Spicer-Dufay (British), Ltd., has for some time past been manufacturing Dufaycolor film, and has recently made arrangements for the disposal of the whole of the company's output for the next two or three years. A new factory is now in course of construction, and should be in opepration early next year.

IN THE CHANCERY DIVISION on Monday, Mr. Justice Bennett had before him a petition by Phosferine Products, Ltd., for the confirmation by the Court of a reduction of its capital from £60,000 to £30,000. Mr. Heckscher, for the company, said all the shares were shilling shares and 800,000 were issued and fully paid up. It was proposed to write off £30,000 by reducing the shilling shares to 3d. The company was prepared to market a health wine. His lordship: What a ridiculous thing! Mr. Heckscher said the losses were due to trading. They manufactured health salts. His lordship confirmed the reduction.

THE TOTAL IMPORTS of chemical and apothecaries' wares, not including drugs proper, or products containing alcohol into Malta for the first half of 1931, were valued at $99,293. The principal source of supply was the United Kingdom, but a considerable business is done in Italian preparations owing to the strong hold of the Italian element of the population on this class of business. The United States was credited with $3,309 for the period under review. The duty on British goods is 10 per cent. *ad valorem*; under the general tariff, foreign importations are assessed at 20 per cent. *ad valorem*.

Books Received

Annual Reports on the Progress of Chemistry for 1934 (Vol. XXXI). London: Chemical Society. Pp. 442. 10s. 6d.

The Finnish Timber and Paper Calendar 1934-35. Edited by Onni O. Ojala. Helsingfors: Frenckellska Tryckeri Aktiebolagte.

Forthcoming Events

LONDON

Apr. 8.—Institution of the Rubber Industry (London Section). "The Strength of Vulcanised Rubber." W. H. Reece. 7.30 p.m. 12 St. James's Square, London, S.W.

Apr. 9.—Institution of Petroleum Technologists. "The Boundary Friction of Oxidised Lubricating Oils." Dr. E. R. Redgrove. 5.30 p.m. Royal Society of Arts, John Street, Adelphi, London.

Apr. 10.—Electrodepositors' Technical Society. "Electrodeposition of Tin for Refrigeration Purposes." E. A. Johnson. 8.15 p.m. Northampton Polytechnic Institute, St. John Street, Clerkenwell, London.

Apr. 10.—Society of Chemical Industry (Road and Building Materials Group). "Composition and Properties of Portland Cement." F. C. Lea. "Some Factors Affecting the Durability of Cast Stone." F. L. Brady. London.

Apr. 11.—Institute of Metals (London Section). Annual general meeting and open discussion. 7.30 p.m. 83 Pall Mall, London.

Apr. 11.—Oil and Colour Chemists' Association. "Modern Methods of Oil Refining with Special Reference to Varnish Oils." C. W. A. Mundy. 30 Russell Square, London.

BIRMINGHAM

Apr. 9.—Society of Chemical Industry (Birmingham and Midland Section). Annual meeting of the Section. 6.45 p.m. "A New Type of Hydrogen Electrode for pH Determination," H. C. Lockwood; "Some Properties of Sodium Metaphosphate," S. Barratt; "The R.A.B.R.M. Thickness Gauge and Hardness Tester," Dr. G. W. Usherwood. 7.30 p.m. University Buildings, Edmund Street, Birmingham.

DERBY

Apr. 8.—British Association of Chemists (Notts. and Derby Section). Annual meeting of the Section. 7.15 p.m. Cavendish Café, Cornmarket, Derby.

GLASGOW

Apr. 12.—Society of Dyers and Colourists (Scottish Section). Annual general meeting. 7 p.m. Royal Technical College, Glasgow.

LIVERPOOL

Apr. 11.—Institute of Chemistry (Liverpool Section). Annual general meeting. A demonstration of laboratory aids will be organised by L. V. Cocks. 7.30 p.m. Constitutional Club, India Building, Water Street, Liverpool.

MANCHESTER

Apr. 12.—Oil and Colour Chemists' Association (Manchester Section). Annual meeting and smoker. "The Manchester," Ltd.

Apr. 12.—Society of Dyers and Colourists (Manchester Section). Annual meeting. Short papers and discussion. 7 p.m. 36 George Street, Manchester.

SHEFFIELD

Apr. 10.—Society of Glass Technology. 2 p.m. Annual general meeting. University, Sheffield.

STOKE-ON-TRENT.

Apr. 8.—Ceramic Society (Pottery Section). "Pottery Printing." B. J. Bell, J. H. Latchford, A. H. Hawley. 7.30 p.m. North Staffordshire Technical College, Stoke-on-Trent.

Company News

Burt Boulton and Haywood.—A dividend of 2 per cent., less tax, is announced on the ordinary shares, payable on April 15.

British Drug Houses, Ltd.—The payment is announced of a dividend of 5 per cent., less tax, on the ordinary shares for 1934.

Unilever and Unilever N.V.—A final dividend has been declared on the ordinary shares of 2 per cent. in guilders, making 4 per cent. for the year 1934.

United Premier Oil and Cake Co.—It is announced that the directors are to recommend a dividend on the ordinary shares of 7½ per cent., less tax, for 1934. This is the first dividend on these shares since 6 per cent. was paid for 1924.

Tharsis Sulphur and Copper Co.—For the year 1934, the net profit, after allowing £24,757 for depreciation, amounted to £62,617, against £43,713 in the previous year. A dividend of 5 per cent. is announced as compared with nil last year.

American Cyanamid Co.—The report for 1934 shows net profit $2,495,644, against $2,467,682, after deducting all charges, including $1,885,998 depreciation; as at December 31, 1934, the total net current assets were $15,828,949. A cash dividend of $0.10 per share has been paid on the common stock.

Wright, Layman and Umney.—The report for 1934 states that net profits, after taxation, etc., amount to £38,477, against £36,705 a year ago, and the ordinary dividend is repeated at 10 per cent. The reserve again receives £10,000 and an allocation of £2,500 is made to special contingency fund.

Van Den Berghs.—The net profits for 1934 total £365,023, after depreciation, tax, etc. This compares with £358,107 for 1933 and £462,780 for 1932. The ordinary share dividend is repeated at 12½ per cent., less tax, and the carry-forward is increased from £71,225 to £91,875.

Lever Brothers.—A dividend of 15 per cent., less tax, for 1934, is to be paid on the ordinary stock. This is the same as for each of the two previous years. For 1933 there was a net profit of £6,200,698, compared with £6,228,162 for 1932. An allocation of £250,000 was made from last year's profits to reserve, and the carry-forward increased from £250,675 to £265,969.

Jurgens.—An increase of £6,000 is shown in the net profits for 1934 at £265,146. The 1933 net profit was £258,940, while £299,747 was earned in 1932. A 5 per cent. dividend is recommended on the £2,500,000 ordinary capital, the same as a year ago, and the amount carried forward is substantially up from £117,108 to £130,067.

CLASSIFIED SECTION

APPOINTMENTS VACANT

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

STAFFORDSHIRE COUNTY COUNCIL.

The County Council invite applications for the post of

ASSISTANT CHEMIST

for the County Laboratory at Stafford.

Candidates must have the qualification of the Institute of Chemistry, and must have had experience in the work of a Public Analyst's Laboratory.

Commencing Salary £300 per annum, subject to a deduction of 5 per cent. established under the Local Government and other Officers' Superannuation Act, 1922. The successful candidate will be required to undergo a medical examination.

The appointment will be subject to one calendar month's notice on either side.

Forms of Application may be obtained from the undersigned, and must be returned together with copies of three recent testimonials on or before 17th April, 1935.

H. L. UNDERWOOD,
Clerk of the County Council.

County Buildings,
STAFFORD.
23rd March, 1935.

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CHARCOAL, ANIMAL and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3633 East.

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VACUUM and Pressure Pump, watercooled, by Franz Beyer, 30 cub. ft., 300 lb. pressure, complete with 2-way valves, new condition, cheap. Electric Motors and Dynamos, all sizes. Milo Engineering Works, Milo Road, East Dulwich, S.E. 22 (Sydenham 4422).

'Phone 98 Staines.

3 JACKETED Copper Nickel Plated Pans, 40 gals: 25/30 gal. Copper Jacketed Vacuum Pan and Pump: Gunmetal Werner Mixer, Pan 32 in. by 22 in. by 18 in.: Experimental size Triple Granite Refiner Rolls: Carter Jacketed Double Action Powder or Paste Mixer, 1 ton capacity, bottom outlet. HARRY H. GARDAM AND CO., LTD., STAINES.

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"SALTCAKE": Offers wanted for approximately 17½ tons Saltcake (2 cwt. bags) for immediate disposal ex Glasgow. Box No. 1669, THE CHEMICAL AGE, 154 Fleet Street, London, E.C.4.

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